OCT 27 1898

THE IRON TRADE REVIEW

VOL. XXXI. CLEVELAND, O. OCTOBER 27, 1898. CHICAGO, ILL. NUMBER 43

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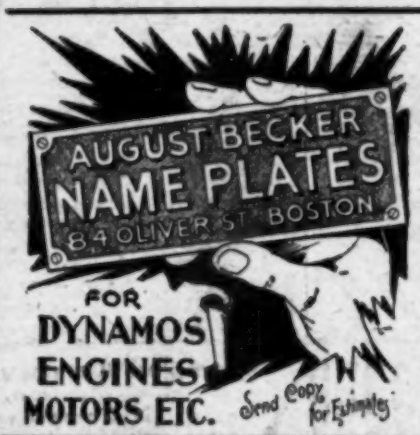

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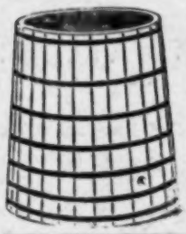

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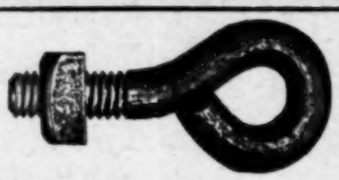

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THE IRON TRADE REVIEW

VOLUME XXXI. CLEVELAND, O. OCTOBER 27, 1898. CHICAGO, ILL. NUMBER 43

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron market continues in that secure middle state in which both producers and consumers are provided for and no marked tendency toward a different basis appears. All the conditions that have brought prosperity to the country remain in full force. Only the uncertainties of the pending election interfere in any degree with the free development of the strong elements in the situation, and thus far only Wall Street has given any sign of hesitation. The Supreme Court decision on the Traffic Association agreement was practically a re-affirmation of the doctrine laid down in the Trans-Missouri case last year, and as rate demoralization could scarcely go farther than in the past year, no marked effect on business is looked for. The railroads seem to be on the verge of liberal rail buying for the coming year, and the certainty that any change in the price will be to a higher rather than a lower basis should bring out large business in the near future. The Federal Steel Co.'s stocks, it would appear, are booked for a strong campaign in the coming months, and this will not be made on low prices for rails, which are far the largest factor in the new company's production. Reports of the past week from all market centers agree that the excess of current production over current orders is more in evidence as the end of the year comes closer. But the fact that consumption has been exceeding production for weeks and is exceeding it to-day prevents the weakness that is usual in the last two months of the twelve. In Bessemer pig iron there is no business to speak of and the associated valley furnaces are busy with shipments on contracts, pending another buying movement, which may be expected in November if the three months interval established by the history of the trade in the past year is observed. The last heavy purchases were in August. Foundry iron holds its strong position. While high freights keep down the export business, the home trade is taking all the iron it can get and the Southern furnaces are practically sold for three months ahead, some for a considerably longer period. Dealers who made sales a short time ago below the prices of the leading producers, expecting to cover with the smaller furnaces, are finding difficulty in placing their orders now. Sales have been made at $7.75 Birmingham for No. 2, but $7.50 has been done also. There is a steady shipment of steel billets and sheet bars from the Pittsburg district for export, on old contracts, but the advance of through freights to British ports to $4.50 and $5 holds up further deals temporarily. There is no disposition on the part of steel works to let go what has been gained in pioneering effort, and the interval of high ocean freights is not expected to be long. There is an easier feeling in some lines—billets, bars and sheets, and some business in plates has been at lower figures. But the mills are not committing themselves to long deliveries; in fact no large business has been offered. Chicago has done something in structural material the past week and considerable work is pending. In the Central West, shipyards have closed for 3,500 tons of plates and shapes, and the next two months will bring out more business from these yards.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
801 TRADESMEN'S BUILDING, Oct. 26.

While no marked decline has taken place in the market yet, the general feeling is weaker than for some time. Export inquiries are numerous but the closing of much business is still handicapped by high ocean freights.

PIG IRON.—Thus far the market is unaffected by the central selling agency's existence. Prices are nominally $9.80 to $10, valley, but lower figures can be had. The movement is so slight that the market price is difficult to locate. Gray forge is quoted from $9.20 to $9.35, with business confined to small lots Several round purchases of basic have been made in the past week. One sale of 3,000 tons was at $9.50 Pittsburg. The foundry furnaces still report healthy order books. One furnace is asking $10.40 for No. 2. The general quotation is $10.15 to $10.25, and the local movement is rather light. Prices are as follows:

Bessemer, valley furnace	$ 9.80	to	10.00
Bessemer, Pittsburg	10.25	to	10.50
No. 1 Foundry	10.50	to	10.60
No. 2 Foundry	10.15	to	10.25
No. 3 Foundry	9.65	to	9.85
Gray Forge, valley furnace	8.80	to	8.95
Gray Forge, Pittsburg	9.20	to	9.35

BILLETS AND RODS.—The market is getting weaker. Billets are now quoted from $15.50 to $15.65, maker's mill, with only fair demand. Sheet bars are quiet at $16.75 to $17, maker's mill, Pittsburg. The scarcity of cars for shipping orders is the plague of both mill and purchaser. Rods maintain their place at $22. The large number of foreign orders taken for delivery well into the coming year has been no inconsiderable factor with steel mills. Meantime billets have been shipped from valley mills to Pittsburg to help out oversold mills.

PIPES AND TUBES.—The continued rush of business has caused the rumor that an advance in prices is contemplated in the near future. A local firm was in the market for 30 miles of 10-inch pipe for one of its gas lines but, being unable to get either satisfactory price or delivery, withdrew from the field. The additional discounts of six tens for less and six tens and two and a half per cent off list for car load lots are still quoted. Base discounts are: Butt weld, black, 55 per cent off; lap weld, black, 65 per cent off, butt weld, galvanized, 47½ per cent off; lap weld, galvanized 52½ per cent off. Discounts on merchant boiler tubes are as follows: 2¼-inch and smaller, 72½ per cent off; 2½ inch and larger, 75 per cent off. Inserted joint casing is now quoted at 60 off and screw and socket joint casing at 60 and 10 per cent off.

IRON AND STEEL SKELP.—The market is firm with quotations as follows: Grooved iron skelp, 1.10c to 1.12½c; sheared iron skelp, 1.22½c to 1.25c; grooved steel skelp, 1.22½c to 1.25c; grooved steel kelp, 1.02½c to 1.05c; sheared steel skelp, 1.10c to 1.12½c.

SHEETS.—Conditions are not altogether favorable. While the mills are generally in fairly good condition, prices allow but little profit. The current demand for both black and galvanized is light. The nominal quotation for black is on the basis of 1.95c for No. 28 and for galvanized 80 and 10 per cent off list with usual freight allowance. Both these quotations have been shaded by some of the mills.

SPELTER.—Reports from St. Louis indicate a higher price for both ores and metal. The present quotation is 5c Pittsburg, though it is reported 4.95c has been done.

RAILS AND TRACK MATERIALS.—The Ohio Steel Co. is solicit-

ing rail orders for delivery after the first of the year. The situation at present is normal, the demand being steady, with no pressure to sell. Light sections are quoted from $19 to $20, and heavy sections at $18. Other materials are quoted as follows: Spikes, 1.45c; track bolts, 1.65c to 1.70c; splice bars 1.10c to 1.15c; links and pins are quoted from 1.20c to 1.27½c.

SPIEGEL.—Our quotation remains at $23.50 to $24.

FERRO-MANGANESE.—We quote $50 for 80 per cent domestic.

PLATES.—The volume of general business is extraordinary. The Coolgardie order will likely be heard from within the next two weeks. Railroad buying is general, but tonnage has fallen off somewhat. Quotations are unchanged and as follows: Tank, 1.15c; shell, 1.20c; flange, 1.25c; fire box, 2c and upwards.

STRUCTURAL MATERIAL.—While the closed season on building work is near at hand, the bridge companies are coming in for a large amount of work in that line. Prices are as follows: Beams and channels, 3 to 15 inches, 1.20c; 18 to 24 inches, 1.30c; tees, 1.25c; zees, 1.20c and angles 1.10c. Universal plates alone at 1.15c; with other shapes, 1.05c.

OLD MATERIAL.—While the demand is fair it is of a hand-to-mouth character. No important changes in prices have taken place, the fluctuations noted being in the line of concessions to obtain business. Among the larger sales of the week was one of 1,000 tons of steel rails at $10 and another of 1,000 tons of iron at $13.75 valley. Other prices are as follows: Wrought iron scrap, $11.75 net, valley; cast borings, $6; busheling scrap, $9.25, net; car wheels, $10.25, gross; cast scrap, $9; iron axles, $6, net; steel axles, $12.50, gross; charcoal scrap, $10, gross; billet and bloom ends, $11; machinery scrap, $9; wrought turnings, $6.75, net.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World.*
1522 MONADNOCK BLOCK, Oct. 26.

The fact that Jubilee week was so noisy on the streets undoubtedly had a good deal to do with its being quiet in the iron and steel trades. Nearly every one spent considerable time jollifying, and business was at a lower ebb than has been the rule lately. The demand for all classes of steel continues good, and considering the distraction, quite a lot of business was done last week. The pig iron trade has been quiet and sales of the week were limited to small lots, though there were a good many of these. The outlook for the future, according to the best posted men in the trade, is better now than for a long time past. The expectation is that a large tonnage will be placed, but it is thought prices will not be much, if any, higher than at present, for some time, at least.

PIG IRON.—All the business closed last week was in small lots, and the demand does not indicate any large increase in sales for the immediate future. Foundries continue to run full and are taking their iron as fast as the furnaces can get it out. In many cases buyers have had to increase their purchases, which at the time were thought to be on a sufficiently liberal scale. The market is very firm, both for Northern and Southern irons. The Northern furnaces are making no concessions whatever to secure business, and those in the South are holding to quotations strictly. The larger producers are still higher than the smaller ones, but a few of the latter are getting full of orders, and are beginning to consider the advisability of advancing their quotations to the level of the high sellers. Quotations are unchanged as follows:

Lake Sup. Charcoal	$11 50 @ $13 00	Southern Coke No. 3	$10 35 @ 10 60
Local Coke Fdy. No. 1	11 50 @ 12 00	Southern No. 1 Soft	10 85 @ 11 10
Local Coke Fdy. No. 2	11 00 @ 11 50	Southern No. 2 Soft	10 60 @ 10 85
Local Coke Fdy. No. 3	10 75 @ 11 00	Southern Silveries	11 25 @ 11 50
Local Scotch Fdy. No. 1	11 50 @ 12 00	Jackson Co. Silveries	12 50 @ 14 50
Local Scotch Fdy. No. 2	11 00 @ 11 50	Ohio Strong Softeners	12 00 @ 12 50
Local Scotch Fdy. No. 3	10 75 @ 11 00	Alabama Car Wheel	15 00 @ 16 00
Southern Coke No. 1	10 85 @ 11 10	Malleable Bessemer	11 50 @ 12 00
Southern Coke No. 2	10 60 @ 10 85	Coke Bessemer	11 50 @ 12 00

BARS.—The market is firm, and quite good sales were made last week, most of them in small lots. The demand keeps up well, but does not seem to be increasing. The market is unchanged at 1.05c to 1.10c for common iron, 1.10c to 1.20c for guaranteed, and 1.15c to 1.20c for soft steel bars from billet stock.

RAILS AND TRACK SUPPLIES.—There is no change in the situation. The mills still refuse to quote on standard sections until after the meeting of rail makers is held. A few small sales of light sections were made in this market last week. No prices are made on rails. Other quotations are as follows: Steel splice bars, 1.15c to 1.25c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

BILLETS AND RODS.—The market is about as reported last week. The mills are full of work for the balance of the year, and are making very few sales of either billets or rods. Billets are quoted at $17 and rods at $22.50.

CAR ORDERS.—One or two good contracts were placed last week, and others are in prospect for the near future. The Armour packing interests are figuring on 200 refrigerator and 1,000 fruit cars, and the order will be placed soon. Car material is in good demand, and sales last week were very satisfactory.

STRUCTURAL MATERIAL.—With no large contracts, there is a steady run of small orders, which seems likely to continue. Several large building projects will probably be announced within a short time. At least two, of large size, are more than likely to go through soon. One contract placed recently was for about 500 tons of steel and iron for a new brewery. Quotations are unchanged, as follows: Beams, 15 inch and under, 1.35c to 1.40c; 18-inch and over, 1.45c to 1.50c; angles, 1.25c to 1.30c; plates, 1.20c to 1.30c; tees, 1.40c to 1.45c; zees, 1.35c to 1.40c. Small lots from stock are quoted at ¼c to ½c higher.

PLATES.—Business has been fairly good, although most of it was in comparatively small lots. Several good orders are in the market and it is expected they will be placed soon. The market is inclined to be a trifle weak, although some mills are asking and obtaining the highest prices asked. Quotations are made as follows: Tank plates, 1.20c to 1.30c; flange steel, 1.30c to 1.40c; firebox steel, 1.85c to 5c.

SHEETS.—There is a good demand, and sales of both black and galvanized sheets last week were fair. Dealers are looking for a continued good business. The market is firm at 2.10c to 2.10c for black and 80 and 5 per cent discount for galvanized.

MERCHANT STEEL.—Sales were excellent last week, and included several quite large orders for mill shipment. The demand is heavy, and seems likely to continue so for some time. Mills are full of business, and are exercising caution in accepting business for anything like nearby delivery. Quotations follow: Open-hearth spring, tire and machinery steel, 1.65c to 1.75c; smooth finished machinery steel, 1.60c to 1.70c; smooth finished tire, 1.50c to 1.60c; tool-steel, 5.50c to 7.50c; specials, 11c and upwards.

SCRAP.—Very little business was done last week in any kind of old material. The demand is light, but one or two small contracts for old iron rails were placed. Dealer's selling prices are as follows:

Old iron rails, gross	$12 50 @ $12 75	Axles, net	$14 25 @ 14 75
Old steel rails, long, gr.	10 50 @ 11 00	Cast borings, net	4 25 @ 4 50
Old steel rails, short	8 75 @ 9 00	Wrought turnings, net	6 00 @ 6 50
Old wheels, gross	11 00 @ 11 50	Axle turnings, net	7 00 @ 7 25
Railroad forge, net	11 50 @ 12 00	Mixed steel, gross	7 25 @ 7 50
Dealer's forge, net	10 00 @ 10 50	Stove plates, net	5 75 @ 6 00
No. 1 mill, net	7 50 @ 8 00	Heavy melting steel, gr.	8 25 @ 8 50
Heavy cast, net	8 50 @ 9 00	Old iron splice b., net.	12 75 @ 13 00
Malleable cast, net	8 00 @ 8 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Oct. 26.

The situation in Lake Superior iron ores is a parallel to that in the pig iron market at large—consumption in excess of production. It is not possible to make close approximations until the shipments for 1898 can be more exactly figured; but there are evident the elements of a strong situation for the coming year. In the first place the estimated production of Bessemer properties on the old ranges, which was about 6,100,000 tons, will be reduced about 1,100,000 tons by shortages already developed, and this deficit may be increased in the closing month of the season. The non-Bessemer ores of the old ranges have been so well sold up that it is doubtful if a 5,000-ton lot of standard ore could be picked up now. In this respect the present condition is almost without precedent. All season long mine managers have been trying to increase their working forces, but the supply is still much below the demand and the advances made at properties in Minnesota have not yet resulted in bringing back any of the forces scattered from the Lake Superior region by the low wages of the past few years. Careful estimates of present consumption of Lake Superior ores indicate a rate that if kept up for the balance of the ore year—that is, to May 1, 1899—would yield a total considerably beyond 13,500,000 tons, the estimated

shipments for 1898. The requisitions of the furnaces upon dock stocks, which were very light last year after the close of navigation, will be quite heavy this year, direct shipments not having been possible to the extent desired, owing to deficient car service. Shipments of ore east of the Alleghenies this year, estimated early in the season at 500,000 tons, have come close to 1,000,000 tons. The bearing of these various factors upon the ore trade of 1899 is already being canvassed. Some increase in mining wages for 1899 seems certain. Lake freights will naturally be somewhat higher, in view of the transfer to the Atlantic Coast of boats capable of carrying about 1,500,000 tons in a season. Yet the export trade in steel and other considerations which have been canvassed heretofore in connection with the ore outlook, will limit any advance that may come, to a nominal amount. Non-Bessemer properties, in particular, will welcome an upward movement, for no one claims that at $1.80 to $1.90 Lake Erie port, any profit is yielded by a royalty-paying mine.

PIG IRON.—The Bessemer pig iron market is bare of transactions so far as valley furnaces are concerned. Shipments of iron, some of it bought at $10 valley, much of it at the cut figures that brought a change in the selling plans of the associated furnaces, are being made on a liberal scale. Pittsburg district steel works are not only large consumers, but their shortages on billets which valley works are supplying have kept the Bessemer converters of the latter going at their best pace. We quote Bessemer nominally at $9.75 to $9 85 valley furnace. Should a buying movement come in November, in the three months cycle that has been the rule in the Bessemer iron market for some time back, the actual strength of the market can be tested. Sellers of foundry iron hold their position well. $9.50 to $9.75 valley furnace being the range for No. 2, though concessions on freights have made some slight variations. Basic iron has sold rather freely in the past week, Pittsburg prices ranging from $9.25 to $9 65, an unusual variation. Lake Superior charcoal is firm and unchanged. We quote f. o. b. Cleveland:

Bessemer	10 40@10 55	Valley Scotch No. 1	$10 40@10 50
No. 1 Strong Foundry	10 40@10 65	Valley Scotch No. 2	10 15@10 40
No. 2 Strong Foundry	10 15@10 25	Gray Forge	9 40
No. 3 Foundry	9 65@ 9 90	Lake Superior Charcoal	11 50

FINISHED MATERIAL.—A Pittsburg plate mill that has not figured extensively heretofore in connection with shipyard work took the plates for a Toledo boat and for the new barge about to be built by the Globe Iron Works Co., Cleveland, in the past week. The shapes for the former went to an Eastern Pennsylvania mill and those for the latter to a mill in Western Pennsylvania. The two contracts call for nearly 3,500 tons of material. In other lines there has been a fair run of small orders. Here and there more of an effort appears on the part of mills to get a good supply of work for the winter. Plate orders promise to go largely to mills that have not loaded up on big work. The quotation remains at 1.10c to 1.15c Pittsburg. More shipbuilding work is expected to develop in the latter part of the year. Sheets are easier, No. 28 being sold at 2.02½ Cleveland. In galvanized, larger lots have been bought at 80 and 10 and 2½ per cent off, Pittsburg, with freight allowance. Iron and steel bars are unchanged, with prices on the former quoted 95c valley mill and on the latter, 95c to 97½c, Pittsburg. Wire mill operations have resumed in Cleveland in the past week, and a steady output is promised for the next few months. We quote $1.22½ Cleveland, on smooth wire and $1 37½ on wire nails, single car-load lots.

CINCINNATI.

Oct. 24.

Business in this market still continues to be made up of small things. There is a fair run of car load orders and 100- and 200-ton lots are not uncommon, but anything much larger than this is exceptional. However, the Southern furnaces are gradually getting in better shape. As they have not been crowded with new business they have been able in a measure to get in better condition as far as orders are concerned. Soft grades are still scarce and the car famine in Birmingham still continues, but affairs are not so acute as they were a fortnight ago. It is needless to say that prices are being firmly maintained. Some of the Southern furnaces are refusing to sell anything beyond limited stocks of certain grades on hand. Some very conservatively accept orders only for deliveries this year. Others are booking such orders as they feel reasonably safe in furnace output. The Tennessee company is entering orders at its prices for future deliveries, but with 320,000 tons on its order books, necessarily finds it difficult to give assurance of exact observance of delivery dates. The Northern furnaces producing foundry and mill grades, continues to enjoy an active demand and are satisfied with the volume of business going. Charcoal irons are in active request, as they have been for some time. Hanging Rock is getting its share of the business. The demand is for all classes and grades with gray forge for puddling in the rear. We quote f. o. b. Cincinnati: Southern coke No. 1 foundry, $10 to $10.25; No. 2, $9.75 to $10; No. 3, $9.25 to $9.50; No. 4 and gray forge, $8.75 to $9; mottled, $8.75 to $9; No. 1 soft, $10 to $10.25; No. 2, soft, $9 75 to $10; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Jackson Co., silvery, No. 1, $12 to $12.50; standard Georgia car wheel, $14.25 to $15.

BUFFALO.

Oct. 25, 1898.

An increased demand and a lively interest in charcoal iron are the only changes in the situation worthy of note. Shipments continue at a rate unprecedented and local furnaces are literally snowed under, finding it impossible to keep peace with their customers. Under such a condition any increase in demand is considered more a matter of regret than otherwise. There appears no possibility that the relation of supply and demand will be easier before the mid-winter holidays. There is no change in prices, the market being firm at such advances as have already been made. We quote for cash f. o. b. cars Buffalo: No. 1 strong foundry coke iron, Lake Superior ore, $11.25; No. 2, $10.75; Ohio strong softener, No. 1, $11 25; No. 2, $10.75; Jackson County silvery, No. 1, $14; Southern soft, No. 1, $11.75; No. 2, $11.50; Lake Superior charcoal, $12 to $12.50; coke malleable, $10.75.

PHILADELPHIA.

Oct. 25.

The market cannot be called active. In some mill products the feeling is easier. On ordinary lots quotations are not lower but good sized orders would probably bring a concession of $1 a ton. Most of the business reported is in small lots, for early delivery, and on these prices are practically unchanged. The export demand has been good recently, but freights are high and for the present practically prohibitive. Shipments of steel plates were made last week to Copenhagen and from Southern ports pig iron was sent to European and Asiatic points. In pig iron local sellers are still firm in their views, the statistical situation being admittedly strong. There is little talk of further advances, however, the long period of excessive supply making it well nigh impossible to beget a serious expectation of measurably higher prices than to-day's. The history of the last two months of every year is well remembered, and the knowledge that production is always greater at that period than new business booked gives buyers security in their position. The strength of the general situation is well recognized. There is confidence that the domestic demand will be well maintained and that export business, with foreign iron markets buoyant and steel works abroad full of orders at good prices, will rather increase, unless the entirely unforeseen occurs. Buyers of pig iron are provided for, in many cases for three or four months to come, but others who need more iron than they had calculated on are paying quite full rates on small lots. Southern furnaces are doing less in this district than in several years and the absence of this competiton would probably be reason enough for an immediate advance at any other season of the year. We quote as follows for Philadelphia delivery, rebates being allowed from these prices for delivery within 100 miles south and west: No. 1X foundry, $11.75 to $12; No. 2X foundry, $10.75 to $11.25; No. 2 plain, $10.50; standard mill iron, $10 to $10 25; ordinary mill iron, $9 75; basic iron, $10 25; Bessemer iron, $12 to $12.50. The quotation on billets is $17.75 to $18; but no business is reported. It is probable that some of the finishing mills would book orders for delivery in the next two or three months at prices below those of a few weeks ago, as deliveries are exceeding new orders. We quote beams and channels at 1.40c up to 15 inches wide; plates, 1.30c; angles, 1.25c to 1.30c; bar iron at 1.10c to 1.15c; steel bars, 1.15c; special branded iron, 1.25c to 1.30c. Old material is unchanged, except as to iron rails, which are scarce at $12.50 to $12 75. Car wheels are $10.50; heavy steel scrap, $10.50 to $10.75; machinery cast scrap, $9.25 to $9.50—all prices delivered in buyer's yard.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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THE TIN PLATE COMBINATION.

Buyers of tin plate are evidently proceeding on the assumption that combination efforts cannot be brought to a successful issue. Yet every week brings more positive assurances from those who are close to the promoting syndicate, that arrangements have progressed so far that the consolidation is as sure as anything not positively closed can be. It is said in answer to the doubts expressed as to the ability of those in charge of the deal to finance it, that capital is assured in amount ample for the taking up of the options that have been secured, even though the present tinplate companies elect to take all cash and no stock, as they may be expected to do. Though one firm does not know on what basis another is being dealt with, it would appear that all the propositions are on a liberal basis, from the statement that $32,000 per hot mill is the basis of the offers. This should leave an excellent margin for plants built with any approach to the economies possible now, when an investment of $100,000 will command a four-mill plant.

It is understood that in a few cases where tin plate plants have been built as departments of establishments engaged in other lines of iron and steel manufacture, there is no expectation of taking the entire establishment, as was the plan of the originally promoted wire mill consolidation. The options taken in such cases are merely for the tin plate plants as they stand, with all equipment. It need hardly be said that such plants will be the most convenient to shut down, if it should come to a choice between mills in a restrictive movement.

Of the disposition of manufacturers toward the combination our contemporary *Tin and Terne* says:

> There is no doubt that the great majority of the tin plate manufacturers are very anxious indeed that the trust should go through. The tin plate market has been in such an unsatisfactory shape for a year or more back that they are thoroughly sick of a business which at first promised good profits. They hail with delight the opportunity which has presented itself to them of getting rid of their plants without an actual loss of the capital investment. While there is no question that the options which have been given fully cover the plant values as they would be determined by appraisement, such appraisements do not begin to cover the money which has been sunk in tin plate through repairs, improvements, alterations, depreciation and replacement of almost new machinery by other machinery only a trifle better. All these have to be charged against the supposed large profits of an earlier period in the business when prices were higher, but when in fact it cost a great deal more to make tin plate on account of lack of knowledge and the losses always attendant upon the prosecution of a business which is in its infancy.

That the promoters of the trust are calculating on some advance above the unprofitable prices of to-day is evident from some of the figuring that is put out in the stock columns of the newspapers. A saving of $1,000,000 on transportation alone is counted on, through the avoidance of the cross shipments of competitive mills. Then 50 cents a box is allowed as profit. Calculating the output of 1898 at 8,000,000 boxes, which manufacturers now believed will be attained, gives $4,000,000 more, which added to $1,000,000 makes a total of $5,000,000. It is not difficult to see, on such a reckoning, that investors would be attracted by the proposal of $25,000,000 preferred and $30,000,000 common stock. To meet dividend requirements on the preferred stock $1,750,000 would be needed, leaving more than $3,000,000 for common stock. If the intention is to hold prices high enough to give a profit of 50 cents a box, outside capital may be tempted, in spite of the warnings of those now in the business, to make good the rule that overcapitalized combinations are a stimulus to competitive investments.

STEEL WORKS AND FOREIGN TRADE.

The reference in Mr. Carnegie's interview printed elsewhere, to the proportions of the export trade of the steel works of the United States may be a surprise to many. The recent growth of foreign business in billets, sheet and tin plate bars, plates and bar steel, he says, has been such as to warrant the expectation that one-fourth of the Carnegie Steel Co.'s output of finished material will soon be going abroad. This ought to satisfy the foreign prophets of a brief export career for the United States, that there is more in our campaign for foreign trade than a desire to exploit American possibilities and serve notice on the world that American steel works can take business anywhere and at any time they seriously go after it. The export business out of Pittsburg, as the record of shipments in the past year will show, has been steadily growing, and it has been the purpose of the steel companies at every stage of the campaign, not only to hold what had been established, but to make regular gains upon it. In the recent period of high prices for billets and sheet bars, when the home trade offered an unusual profit, export orders were regularly booked even though they involved much less margin than domestic business. The decision to go after foreign orders carried with it the deliberate decision to make what temporary sacrifices were needed to hold and extend it; and the surprising fact about it is that it has so rapidly expanded, and has so soon given promise of substantial returns.

THE evenness of imports of iron and steel, as compared with those of last year in a corresponding

period, is the feature of the import record that will attract attention. It will be seen that the imports of tin plate in August were at the rate of less than 1,000,000 boxes a year, while the domestic production is now at the rate of 8,000,000 boxes a year:

IRON AND STEEL IMPORTS TO THE UNITED STATES.—GROSS TONS.

	August.		Jan.—Aug.	
	1897	1898	1897	1898
Pig iron	733	2,000	9,853	18,076
Scrap iron and steel	25	169	699	841
Bar iron	1,076	1,933	8,074	17,064
Iron and Steel Rails	23	.....	138	190
Hoop and band iron	.....	.....	1	3
Ingots, blooms, etc	877	901	11,486	7,482
Sheets and plates	138	109	1,673	1,619
Cotton ties	.....	.....	105	.....
Tin plates	5,224	4,206	63,533	53,919
Wire rods	1,472	1,270	9,777	11,083
	9,568	10,588	105,339	105,277

IRON AND STEEL EXPORTS STILL GROWING.

The fact that $7,452,522 worth of iron and steel products were exported from the United States in August is a gratifying sign of the growth of this trade, set alongside the $5,049,865 of August, 1897. The gain is 50 per cent, a fair proportion of which is in machinery. The pig iron export trade for the year up to Sept. 1 is not what might have been supposed from some of the statements telegraphed from Birmingham, and the calendar year 1898 is likely to show a falling off from 1897, due largely to the war. The steel rail trade makes an excellent exhibit; and several other forms of finished steel have made gains that are noteworthy:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	Aug.		January—Aug.	
	1897.	1898.	1897.	1898.
Pig iron { ferro	1,043	59	2,532	3,425
Pig iron { all other	14,952	17,928	151,393	122,705
Scrap	6,950	10,064	29,685	49,447
Bar iron	281	688	2,949	3,720
Steel bars (not wire rods)	1,018	3,128	36,209	16,817
Iron rails	7	.....	4,300	1,350
Steel rails	9,201	22,436	76,313	196,128
Billets, ingots and blooms	1,475	2,891	*2,229	17,586
Hoop, band and scro'l iron	215	133	515	563
Wire rods	3,443	3,828	*5,364	8,328
Iron sheets and plates	500	536	2,345	2,319
Steel sheets and plates	194	4,396	1,528	16,895
Tin plates, terne plates, and tagger's tin	.....	5	†	13
Structural material	2,802	3,872	†3,828	23,188
Wire	4,688	6,492	34,311	47,840
Cut nails	1,061	1,186	2,966	10,424
Wire nails	912	550	1,788	6,937
Other, including tacks	108	172	2,662	1,402
	48,850	78,246	360,917	526,067

(*) Not separately stated prior to July, 1897.
(†) " " " " " Dec. 1897.

Personal.

C. H. Thompson has become connected with the Chicago branch of Howe, Brown & Co., 55-59 N Jefferson st., as salesman. Howe, Brown & Co. are manufacturers of high grade steel, Howe's special tool steel, and Howe's self-hardening tool steel.

S T. Wellman, of Cleveland, has returned from a trip to Europe.

W. P. Palmer, of the Illinois Steel Co., has returned from Europe.

H. M. Curry, of the Carnegie Steel Co., is in California with the expectation of remaining for some time.

Andrew D. Smith, president of La Belle Steel Works, Pittsburg, died Oct. 21, aged 77 years.

H. B. MAXWELL, manufacturer of saddlery hardware and specialties, Rome, N. Y., is putting up a small plant to manufacture light steel castings, to take the place of malleable iron in the products of the works. The process is especially adapted to small pieces and an excellent metal is made of greater strength than malleable cast iron.

STOCKS of pig iron in warrant yards were reduced about 20,000 tons in September—this being in addition to the reduction of 80,000 tons in stocks of iron at furnace yards. In the 10 days ending Oct. 20, there were withdrawn 9,100 tons of warrant iron, and in the same period 1,600 tons was put in yard, making the total Oct. 20, 205,100 tons.

INTERVIEW WITH MR. CARNEGIE.

On his arrival at New York on Wednesday, Oct. 19, Andrew Carnegie was interviewed on several matters of moment to the iron trade Those portions of his answers which relate to the new shipyard project at New York and to the export trade in iron and steel will be found of special interest:

"I called the attention of the Western shipbuilders to the opening presented for a good shipyard in New York nearly two years ago and I have had letters from several upon the subject. I know also of a leading shipbuilding concern in Great Britian which is considering the matter. It is obvious to any man that the United States is going to assume its original position as the chief shipbuilding nation of the world. What is the use of sending thousands of tons of steel to Glasgow and Belfast as we're doing when we might as well build the ships here and send them? A shipbuilder in this country to-day has the advantage of about $4 per ton in cost of all steel materials, and he has all his woodwork cheaper than builders in either Great Britain or Germany, and if he cannot take the shipbuilding trade of the world what is the matter with our shilpbuilders? I do not forget that we have three very creditable shipyards now—Newport News, one of the best in he world; Cramps', in Philadelphia, and Scott's, in San Francisco. These three shipyards will, of course, extend and prosper, but there is plenty of room for another shipyard here."

"Do you propose to take any steps in aid of the new project?"

"Well what have we done toward it? We have assisted in placing the steel at the disposal of shipowners here several dollars per ton cheaper than any others in the world can get it. I think that is doing a big part in the matter. When we are asked to take an interest in one shipbuilding concern, we naturally hesitate. We are the friends of the shipbuilders. Are we going to compete against them? No; emphatically no. We remain the friends of all shipbuilders, the allies of none. My heart is in seeing the United States resume her former position, as I have said, the foremost shipbuilding nation of the world. It is upon the cards I believe that the Carnegie Steel Co would contract with any responsible shipbuilding company to furnish it all of its steel at several dollars per ton less than any shipyard in the old world is able to obtain it, and thes for any number of years that the concern may desire. Steel is bound to be cheaper in this country than in any other country. Great Britain has no supply of raw materials to make steel; her coal is getting dearer; her ore is nearly exhausted. Germany never could make steel and deliver it to the shipyard as cheaply as Great Britain. The whole shipbuilding business of the world lies open to the United States, and this will become more and more apparent every year. We have the raw materials and no other country possesses them to such an extent."

Regarding the question of territorial expansion, Mr. Carnegie said:

"If the United States is going to undertake the government of the Philippines and go in for expansion throughout the world, putting her hand in the hornet's nest of European rivalry, there can be no prosperous business. We shall be subject to wars and wars' alarms. Business is the child of peace. The entrance of the United States as a new power in the far east will set every one of the present powers to a study of the question from a new standpoint. We shall be compelled to increase our navy. We must pay for a large standing army, and there is neither rest nor security for us. Before the American people comes now the most serious issue since the issues of independence and of secession. A false step now and the future of the Republic will, in my opinion, be seriously impaired and its industrial career retarded. The development of one State in the Union in peace and security will outweigh all the increase of profit we can get from foreign trade in any of the worthless possessions which we can attempt now to take. The Philippines have a certain trade which cannot be greatly increased; the wants of the people are few; barbarians are no customers; civilized people are the consumers for our products."

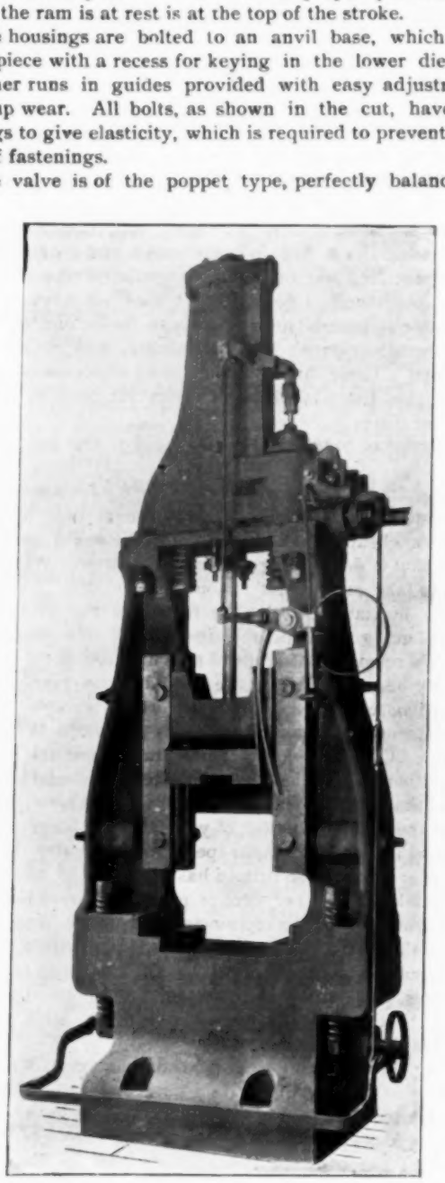
THOS. WATHEY, of Cleveland, has removed to Newark, N. J., to take charge of the foundry department of the Hay Foundry & Iron Works.

STEAM DROP HAMMER.

The Lane Tool Co., of Cleveland, has placed upon the market recently a steam drop hammer of which the illustration represents the 1,000-pound size. The hammer is double acting, taking steam below and above the piston. When a single blow is desired, a quick pressure of the foot upon the treadle causes the ram to fall, and when the treadle is released, instantly the ram rises to its proper position, which when the ram is at rest is at the top of the stroke.

The housings are bolted to an anvil base, which is one solid piece with a recess for keying in the lower dies. The hammer runs in guides provided with easy adjustment to take up wear. All bolts, as shown in the cut, have spiral springs to give elasticity, which is required to prevent breakage of fastenings.

The valve is of the poppet type, perfectly balanced and



working in a casing that can be replaced, in case of wear, at small expense.

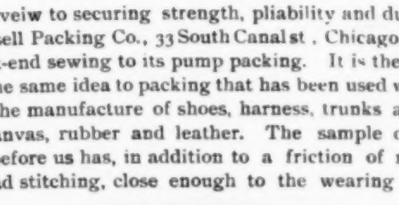
The diameter of the cylinder of the 1,000-pound hammer is eight inches; length of stroke, 36 inches; space between guides, 18 inches. The hammer weights about 15,000 pounds and stands about 14 feet high. In the design and construction of these hammers no effort or expense has been spared to make them perfect.

Production of Manganese Ores in 1897.

The report of John Birkinbine to the United States Geological Survey on the production of manganese ores in the United States in 1897 shows a total of 11,108 tons against 10,088 tons in 1896. Arkansas contributed 3,240 tons, Georgia 3,332 tons and Virginia 3,650. It is stated that the influence of a small increase in the phosphorus content upon the commercial values of ores has restricted the output, and this, added to the uncertainty as to the extent of deposits, has forced the country to rely upon foreign sources for the greater portion of its supply. Of manganiferous iron ores produced in 1897, the total of manganiferous ores was 202,304 tons; manganiferous silver ore, 149,502 tons, and manganiferous zinc ore, 33,924 tons. The bulk of the manganiferous iron ore was contributed by the Lake Superior region, its total being 184,585 tons. Colorado mined 16,519 tons and Vermont 1,200 tons. The Lake Superior ores classed as manganiferous contain from 4 to 1.5 per cent of manganese.

Wax End Sewing in Pump Packing.

With a veiw to securing strength, pliability and durability, the Goodsell Packing Co., 33 South Canal st., Chicago, has applied wax-end sewing to its pump packing. It is the employment of the same idea to packing that has been used with good effect in the manufacture of shoes, harness, trunks and belting in canvas, rubber and leather. The sample of pump packing before us has, in addition to a friction of rubber a wax thread stitching, close enough to the wearing edge to



prevent the plies from loosening or separating, and far enough to prevent damage by abrasion. This secures the fabric in oil, naptha, ammonia or any other line of pump service and has proved serviceable in all pumping plants. It is known to the trade as Goodsell's "98" hydraulic. Samples are sent by the mlnufacturers.

Pullman Co. May not Own Pullman.

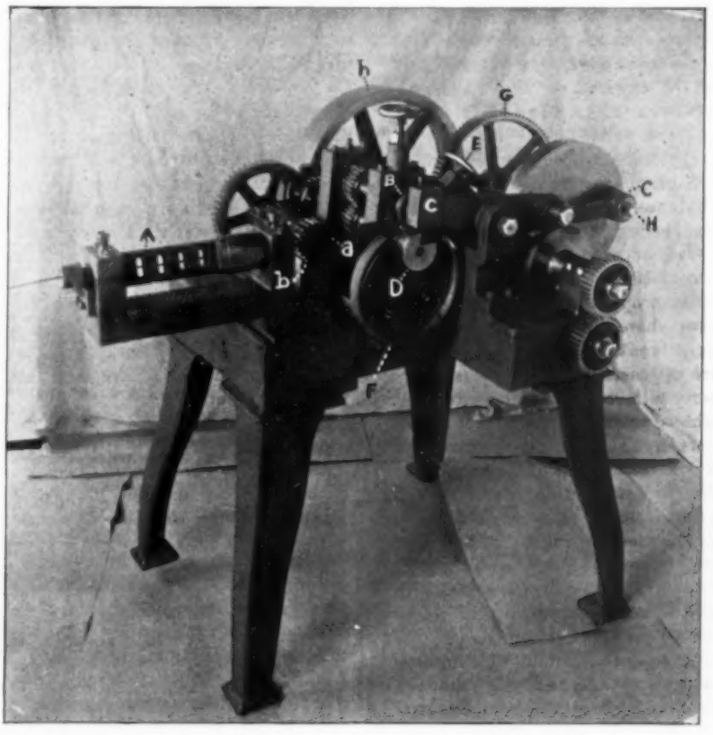
An important decision was given by the Supreme Court of Illinois on Oct. 24, in the case brought by the attorney general of the State on behalf of the people, against Pullman's Palace Car Co. The case was originally brought in the circuit court, of Cook County, the complainant alleging that the corporation usurped power not granted in its charter when it bought the real estate and built thereon the town of Pullman and also in owning stock in the Pullman Iron & Steel Co. The lower court decided in favor of the defendant. The decision just made reverses this and remands the case for trial in the Cook County court. The gist of the decision of the Supreme Court may be stated thus: The court holds that the charter of the company did not clothe it with power to purchase the real estate upon which the town or city of Pullman is built, or to construct the buildings in said town or city, or to engage in the business of renting dwellings, storerooms, market places, etc. It holds that it "may not own stock in the Pullman Iron & Steel Co., but that it may sell liquors to the passengers on its cars. It may properly own the Pullman building in Michigan avenue, in which the general offices are located. It may properly own 25 acres of land near the Belt Line Road for the reception of its cars, and it may properly furnish power to the Allen Paper Wheel Co.

THE Clonbrock Steam Boiler Co. of Brooklyn, N. Y., manufacturer of the Morrin Climax steam boiler, announces that the suits it brought against Thomas J. Lawler and the Edison Electric Illuminating Co., of Brooklyn, for infringement of the Morrin patents on the Climax boiler have been tried before Judge Edward B. Thomas, in the United States Circuit Court for the Eastern District of New York, and have been decided in the plaintiff's favor, all the patents in suit being fully sustained. In the concluding portion of the decree the court says: "The combination as a whole performs a duty that no combination of such parts has performed before, and that gives it patentability. The law intends that the patent shall be preserved, unless its invalidity appear beyond a reasonable doubt, and when a machine, created pursuant to the specifications of letters patent, has reached in its domain the greatest distinction for useful operation, while others who have sought the same ends have failed substantially, and when the rights are of great pecuniary value, and have enlisted large financial undertakings, a court of equity should not be diligent to discover nice resemblances to former inventions, especially in behalf of a person who had recognized its validity through years of service in commending it to the public, and whose own signature acknowledged its validity."

RING FORMING MACHINE.

The illustration shows a ring forming machine manufactured by the F. B. Shuster Co., of New Haven, Conn. Its special feature is its continuous formation of rings, taking the wire directly from the coil. The wire is fed from the coil through the straigthtener A by means of feed rolls B, one of which is back of the cutting off lever head C, and one back of the cutting off anvil D. It forms into any size ring from 3 inches diameter to 16 inches diameter by adjusting the stroke of the connecting rod C by shifting the pins of the disc H nearer the center. This adjustment is made by means of screws running through the center of the disc and engaging the crank pins. In forming the different sizes of rings it is necessary to adjust the roll on the end of the slide back of the cutting off lever C, and adjusted by the hand wheel E, rolling the wire into the cast ring F, fastened upon the plate shown on the face of the machine, and which ring acts as a guide for the rings being formed.

In the formation of rings the lever C cuts the rings off by contact with the block D; the movement of the lever being



RING FORMING MACHINE.

imparted thereto by means of cams, shown at the end thereof. The ring then drops by means of gravity from the guide into whatever receptacle may be provided.

The gear marked a is actuated by the rack marked b. The movement of this rack is reciprocating and its motion is transmitted thereto by the revolving of the disc H with the connecting rod of the crank pin thereon; the opposite end of which connecting rod is joined with the rack b. The disc is driven by the balance wheel h, the shaft of which is geared into the gear G, thus giving greater power to the machine. Upon the end of the shaft of the gear a is the gear J, which engages into the set of gears back of the feed roll housings marked R.

Upon the feed roll shafts is a pair of roll ratchets, working in reverse directions, also a paw operating thereon, by the revolving of the disc H. A reciprocating motion is imparted to the rack b which engages the gear a, thus feeding the wire by means of the two ratchets, by its forward and backward motion, continuously forming the same into rings. The time of cutting off of rings is given by the revolving of the disc H with the pin thereon upon which the connecting rod is fastened, at which time the feed is practically at a standstill, thus allowing time, at one revolution of the disc, in which to cut off two rings.

Unlike other machines that make but one ring to a revolution, this machine feeds continuously, making two rings at every revolution of the disc. This makes it a very economical and fast working machine.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Pittsburg Foundrymen's Association was held Monday evening, Oct. 24, at the rooms of the Frohsinn Society, 305 Penn ave., Pittsburg. The meeting was presided over by Mr. Wm. Yagle, vice-president, in the absence of the president. The following members and visitors were present: Secretary F. H. Zimmers, Union Foundry & Machine Co.; I. W. Frank, Frank-Kneeland Machine Co.; H. M. Hooker; S. H. Stupakoff, Union Switch & Signal Co.; E. S. Johnson, Park Bros. Co.; A. B. Harrison, Clinton Iron & Steel Co.; C. Wike, Hall Steam Pump Co.; W. T. Moberly; S. M. Rogers; H. S. Marsh; S. D. Sleeth, Seaman-Sleeth Co.; Mr. McLaren; E. M. Sorg; A. C. Williams; J. R. Gilmer, Mr. Oberholzer; Dr. Wm. B. Phillips, *American Manufacturer;* J. S. Seaman, Seaman-Sleeth Co.; Dr. Richard Moldenke, McConway & Torley Co.; Mr. Shaw; E. A. Uehling, Uehling Casting Machine Co.; Mr. Gunter; E. A. Kebler; Alex. Taylor, Westinghouse Co.; Dr. Stahl, Jas. Irwin & Co.; Mr. Robinson; Mr. Malone; Mr. Kneeland, Frank-Kneeland Machine Co.; J. S. O'Neill; Mr. Evans; J. S. McDonald; B. E. V. Luty, *Tin and Terne;* and J. B. Allen, *The Iron Trade Review.*

E. A. Kebler was elected from associate to active membership.

The annual election of officers resulted as follows: President, Wm. Yagle; vice-president, Dr. Richard Moldenke; treasurer, Phillip Mathes, secretary, F. H. Zimmers executive committee, I. W. Frank, chairman; J. S. Seaman Robt. Taylor, J. S. McDonald, E. A. Kebler.

The report of the committee on amending the constitution was accepted, the changes to be discussed at the next meeting. The amendment to the by-laws, changing the annual meeting from the fourth Monday in September to the fourth Monday in October, was adopted unanimously.

Dr. Moldenke's paper on "The Melting Point of Cast Iron," as given elsewhere, was read and a vote of thanks was tendered the author. Discussion on the paper was postponed until the November meeting owing to the lateness of the hour and the fact that in the adjoining room a collation was awaiting the members, by way of marking the first meeting in the association's new quarters.

THE Pioneer mine is expected to be clear of water in the next two weeks, and active operation will then begin.

STEAM VESSEL MACHINERY ON THE LAKES.

A summary of the machinery of 1,300 steam vessels engaged in traffic on the Great Lakes has been prepared under the direction of Mr. Walter Miller, of Cleveland, Ohio. The substance of the information obtained is contained in a paper read by Mr. John H. Coffin, before the Engineers' Club, of Cleveland. Referring to the survey of the 1,300 vessels, in which work he assisted, Mr. Coffin said:

There are 1,150 screw propellers and a trifle over 50 paddle, or side wheel, propellers; the balance being schooners or tow barges, which are equipped with boilers and steam pumps, or hoisting or steering machinery. Of those fitted with screw propellers, 960 have solid cast wheels, 6 of them being of bronze, 8 of steel and 946 of cast iron; 185 have sectional wheels, one of them being bronze, 6 steel and 178 cast iron. Of the entire number, 1,060 of these propeller wheels are fitted on the tail shafts with straight bore and key, while only 74 are fitted on a taper end with feather and nut, the latter arrangement being more modern practice and considered by most engineers to-day to be the preferable way of fitting propellers on the shafts. Of the paddle wheels, 23 are fitted with feathered floats, and 29 have solid floats.

The lack of uniformity of proportion of parts of these machines is surprising. There seems to have been no hard and fast rules for the construction of engines on the lakes, and each builder has followed his own ideas. In the item of crank-shafts, about 400 are of the solid forged type, 17 of these being of steel and 383 of wrought iron; 780 are built-up shafts, of which 23 are of interchangeable sections, 13 of them being of steel and the balance of wrought iron. Of the total number, 354 are light in section, according to Lloyd's rules for determining the size of crank-shafts. 106 cases were also found where the intermediate shafts are light of section, and 387 cases where the propeller shafts are light by these same rules; and 48 cases where the shaft couplings are reinforced, either on account of breakages or because of developed weakness. There are 296 cases where the thrust bearings are insufficient to properly relieve the crank-shaft from fore and aft strains. A perhaps more serious defect, from the insurer's standpoint, exists in the light cross-head connections, there being 446 cases where cross-head keys are too light and 54 cases where the nuts fastening piston rods in cross-heads are small. A point which seems to have been very sparingly covered by authorities on engine design, and yet which seems one of vital importance, is the bolting of cylinders to columns, of columns to bed-plates, and of bed-plates to seatings in marine engines. The strain to which each of these parts is subjected being a direct strain, the necessary strength of these parts is easily found by computation based on the steam pressure and the size of the cylinders. In these parts 340 cases were found where the cylinders are too lightly fastened to the columns, 68 cases where the columns are insufficiently secured to bed plates, and 64 cases where the bed-plates are not sufficiently bolted to their seatings.

The marine fire-box boiler is the most common type, though it has lost its prestige, the Scotch boiler having rapidly displaced it; 731 boilers of this type are in use to-day. The marine water-tube boiler is of more recent date, only one having been built earlier than 1880. There are none of this type now on the lakes built between 1880 and 1890, but there are 35 vessels, built since 1890, equipped with this type of boiler, and there are several vessels now under construction which are to be equipped with this type of boiler. It is also interesting to note the gradual increase in pressures in boilers built during these several periods, as shown in the accompanying table.

	1860 to '69.	1870 to '79.	1880 to '89.	1890 to '98.
Engines:				
High pressure non-condensing	40	93	185	93
" condensing	6	10	5	4
Steeple compound	22	62	89	39
F. & A. compound	5	12	154	99
Triple expansion	...	...	67	147
Quadruple expansion	...	...	1	6
Walking beams'	8	10	8	7
Inclined and horizontal	1	2	7	9
Boilers:				
Firebox	18	97	392	224
Scotch	1	8	193	348
Water tube	...	1	...	35
Pressures:				
Below 50 lbs	5	3	2	3
Between 50 and 75 lbs	4	19	23	10
" 75 and 100 lbs	5	59	122	29
" 100 and 125 lbs	1	25	318	173
" 125 and 150 lbs	...	3	52	184
" 150 and 175 lbs	...	1	70	161
" 175 and 200 lbs	...	...	...	19
" 200 and 225 lbs	...	1	1	12
225 lbs	...	...	...	2
250 lbs	...	...	...	12
265 lbs	...	...	...	2
300 lbs	...	...	...	1

Two hundred and ninety-five boilers were found having patches inside and 264 having patches on the outside; 82 boilers are poorly fastened to the hulls of the vessels; 139 boilers are without stop-valves between them and the throttle-valves; there are 191 cases where the slip joints in the main steam pipes are not protected with safety guard bolts; there are 134 cases where there are no cocks between the feed check valves and the boilers; and there are 165 cases where the feed check valves are only common pipe checks.

Federal Steel Co. Plans.

President E. H. Gary, of the Federal Steel Co., returned to Chicago this week from an inspection of the Minnesota Iron Co.'s properties, win which he was accompanied by H. H. Porter. The condition of railroad, dock and mining properties of the Minnesota Co. is reported to be very satisfactory. President Gary announced that work will soon begin on 600 new bee-hive ovens at the plant of the Southwest Connellsville Coke Co., now entirely the property of the Illinois Steel Co., and on 300 by product retort ovens at the Lorain Steel Co.'s plant at Lorain, O. The various works of the Illinois Steel Co. have also been inspected in the past week, and all found operating to their full capacity. The South Chicago steel works broke their tonnage record in Bessemer steel, with a total of 3,004 tons in the day and night shifts, Oct. 22. The rail mill also made a new record the same day, 2,457 tons in the day and night shifts.

E. A. Shearson, now holding a similar position with the American Steel & Wire Co., has been appointed auditor of the Federal Steel Co. He will be succeeded in the former company by T. J. Hyman, who has been assistant to the president of the Great Northern and is now auditor of the Wisconsin Central.

President Gary disposes of the rumor that has been going about for several weeks, that the Federal Steel Co. is negotiating for the purchase of the Cleveland, Lorain & Wheeling Railroad. He adds that the Federal Steel Co. is not now considering the absorption of any outside property.

THE preliminary report of gross earnings for September, as compiled by the *Financial Chronicle*, shows a gain of 6.04 per cent, or $2,800,000. The comparison is made with a month of great prosperity. The gain in September, 1897, was $6,386,000, the largest ever shown in any preliminary monthly statement. Therefore it is particularly significant that this year there should still be a gain of more than six per cent. And this gain was made in spite of a falling off in the movement of grain and cotton, and is ascribed chiefly to activity of trade. Seven railroads report increases in gross earnings of more than $100,000 each, beginning with the Chicago, Milwaukee & St. Paul, which has a gain of $481,000; the others are the Great Northern, $293,000; Northern Pacific, $263,000; Southern Railway, $239,000; Big Four, $164,000; Cincinnati, New Orleans & Texas Pacific, $122,000, and Pittsburg, Bessemer & Lake Erie, $106,000.—[Railroad Gazette.

THE decision of the United States Court in Cleveland enjoining the strikers of the American Steel & Wire Co.'s works from interfering with the operation of the plant or with men seeking employment in the works, and from gathering in force in the streets contiguous to the company's property, practically ended the strike. Many of the men went back last week and one of the leaders was appointed foreman in one of the departments. The company will take back all but a few of the strikers.

THE Keasey Pulley Co. has been organized at Toledo, O., as successor to T. D. Keasey, with a view to improving and enlarging the facilities of the concern, to supply the increasing demand for its product of this factory. The company is now able to fill orders promptly and to maintain the standard reached by the Keasey pulley. The management of the company will still remain with T. D. Keasey, who has had eleven years' experience in the manufacture of the Keasey split wood pulleys, with malleable iron center.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

Brittleness in Soft Steel by Annealing. [*Ironmonger*, Sept. 10th.]—Mr. Edward Stead, in a paper read before the Iron and Steel Institute, goes very thoroughly into the causes for the fracture of annealed soft steel when under sudden blows. The discussion was brought about by noticing the behavior of sheet steel when hammered or dished into shape. Though the carbon contents was only .05 to .12 per cent, and it had been annealed 48 hours, it fractured very easily. If a piece of steel is broken rapidly the fractured surface varies in appearance. Thus it may be fine or coarse in grain, or rather finely or coarsely crystalline. A section through a piece of steel when polished and etched shows up a number of irregular polygonal areas. These areas are sections of crystals which have not formed completely owing to mutual interference, and consequently a fresh fracture looks more like a series of grains than real crystals. Those who have studied mineralogy will have noticed the tendency of many crystals to always split along certain planes. Thus a cube must split in three directions, all at right angles to each other. Iron crystallizes as a cube, and therefore the same tendency to a cleavage in the three directions exists in it. The relation of the cleavage planes of the individual crystals to each other in the whole mass forms the basis of an interesting series of studies. The use of the microscope gives us the means of determining with great certainty the cause of the weakness of metals. The weakness may manifest itself in two ways; first, between the crystals or groups of crystals of the metals, and second, in the cleavage planes of the crystals themselves. In the first case the fracture will be found to run along the junction of the crystals. In many instances there are films of foreign substances between the crystals which keep them apart, these substances separating out when the metal solidified or cooled slowly. A small percentage of impurities in gold and copper, for instance, has been shown by Prof. Arnold to leave most marked mechanical and structural effects. The mechanical testing of such metals by laying their polished and etched surfaces downward upon a block of lead and striking them sharply with a blunted center punch in the middle of the back, shows that the breaking up of the structure is always along the line of such foreign matter between the crystals proper. In steel castings the crystals are occasionally enveloped in a film of slag which necessarily must weaken the whole mass. The hard, brittle portions of white carbide of iron surrounding the crystals of softer and stronger material is an element of weakness in steels running over one per cent in carbon. Prof. Arnold has found another source of weakness through the apparent separation of crystals in cooling. This is found in certain steels containing phosphorus. It is thought that after annealing an unequal contraction takes place during the cooling, leaving either an imperfectly jointed junction or else a state of affairs seen in forgings full of residual strains. Here again the failure will be along these imperfect junctions. This first series of weaknesses Mr. Stead calls the "inter-granular." The second class of weaknesses, those due to cleavage, which Mr. Stead calls "inter-crystalline," are found in testing a mass of crystalline grains making up the sample. The fracture is always through the mass and not along the junction of the crystal groups, passing between the molecular crystals which go to build up the crystalline grain. As an evidence of the cubic structure of iron the instance of etching the unpolished cleavage faces of the pure material is given. Here minute square surfaces are eaten away, leaving pits behind, and this on all the six faces.

Another interesting observation made was that a polished surface when etched reflected light with varying degrees of brilliancy. This on examination was found to be due to the position of the crystals, the brightest ones being perfectly flat, the others at a slight angle with the surface plane. Now by tilting the piece slightly the bright spots grew dim and some of those formerly dark became bright, showing that they were now reflecting the light squarely. An interesting little diagram is given showing how the large crystals are made up of these series of molecular cubes and how the line of fracture can be readily traced through the cleavage planes of these large crystals. Now comes the application of these principles to the subject matter in hand. A large grain of crystal of pure iron can be split up in three directions. If a sheet consisted of one such crystal made up of a lot of molecular cubes arranged next to each other and only one high (just as a set of children's building blocks put together on the floor to make up a picture), this one crystal can be broken up readily in two directions, one along the sheet and one across it. Now if this sheet had more layers than one, and the lines of cleavage, while not continuous, came nearly together, the sheet would still be weak along and across its surface, and a few crystals at the surface once separated by a blow would be the means of continuing the fracture through the whole sheet. If now the various groups of crystals had their cleavage planes criss-cross to each other throughout the whole sheet, even if they were large, this sheet would be less likely to break than the fine grained but symmetrically arranged metal.

While the manufacture of iron and steel is run on lines which tend to promote this promiscuous mixing of the directions of cleavage planes, yet occasionally the unexpected happens and soft and pure material may be rendered quite brittle. A piece of pure iron upon beingheated carefully between 1,100 and 1,375 degrees F., gradually developed its structure from a fine grained one to another having large single crystals. The angles of the separate contiguous crystals became altered until they coincided and eventually the junctions disappeared to a large extent—the structure simply became coarsely granular. Now where there are these large crystals there must be large cleavage planes and consequent lines of weakness, and hence the piece will not endure continued severe service. This is, however, more especially the case where the cleavage planes are at right angles to the surface of the material. Where these cleavage planes were not thus, the piece could be readily bent double, but broke upon being straightened again The fine grained material could endure the straigtening without any difficulty. This was found from a long series of experiments. Where the coarse grained pieces thus produced by annealing were again heated up to 1,650 degrees F., a very tough and strong steel resulted, the coarse structure being changed to a comparatively fine one. In an examination of a large number of annealed sheets, all above 18 B. W. G., were found free from brittleness, but among those from 10 to 18 B. W. G., this condition occurred occasionally. In the thicker sheets which came out good from the annealing pots, after being heated from 750 degrees to 925 degrees F., the application of shocks not sufficient to produce permanent set almost invariably caused the development of brittleness. This brittleness was either of the inter-granular or more often the inter-crystalline character. In the former case the sheets broke like cast iron; in the latter the fracture was 45 degrees to the direction in which the sheet was rolled, and at right angles to the surface. In other words, the faces of the cubes had their corners tilted 45 degrees, making the surface look like a cathedral window. Now these sheets are strong when bent square across either way, but invariably break if bent 45 degrees to the direction of rolling. Unquestionably the rolling is the initial cause of this phenomenon The explanation is difficult and Mr Stead supposes that the rolling appears to impress a latent disposition in the steel to crystallize in certain fixed directions, and annealing brings this out more plainly afterwards. To overcome this difficulty further investigations were made. In one case cited there was a difference in the behavior of the two ends of the same sheet, though the composition was identical. Here, then, was a case of unequal annealing. In some cases one side of the sheet was brittle and the other tough, or the outside was brittle and the inside tough, or vice versa. The fact that inside of one-sixteenth of an inch both brittle and tough material existed shows that differences in chemical composition would hardly count for very much. One point only seems to be conclusive, and that is the phosphorus contents, which should in no case exceed .08 per cent. All other remedies tried proved uneconomical and the final solution of the difficulty is still to be found.

In the discussion following the reading of this paper, the president, Mr. Martin, complimented Mr. Stead in giving so clear and satisfactory an explanation of an occurrence puzzling mill men. Prof. Arnold, while agreeing with the main features of the paper, criticized the temperature given as the

crystallization point of iron and then went deeply into the question of primary, secondary and tertiary crystallization and the allotropic states of iron. Prof. Howe discussed the practical aspects of the case and gave as his opinion that a careful regulation of the temperature would be in the right direction. While Mr. Stead had suggested putting the sheets into the rolls at an angle of 15 degrees first and then in the next pass the other way, he thought that an angle of 2 or 3 degrees was enough to set up counter cleavages which would destroy the disastrous effects of those of the regulation 45 degrees. Mr. Harbord recounted his experiences in this direction with tin plate, and hoped for a final solution of the trouble, and the discussion was closed with some general remarks on crystals versus grain.

NEW TOOLS IN OLD SHOPS.

A machinist who buys a new machine tool should feel proud of it. If he does not, there is something wrong with the tool or the machinist, or both. But while unwavering constancy is very desirable in some things, this is a matter in which one's feelings may probably undergo a change, and there usually comes a time in the life of every machine tool when its owner should be ashamed of it, rather than proud of it. This time comes when materially better machines are to be had—machines which are capable of materially reducing shop costs. It is to be remembered that although pride in one's shop and its equipment is a good, if not a vital thing, it must have a substantial basis. Price lists and discount sheets make no allowance for it, and no competitor is less eager or less able on account of it.

There are shop proprietors who cannot imagine how builders of modern improved machine tools can afford to advertise them as they do. These shop proprietors are mostly of the class who never buy an improved tool so long as the work can by any possibility be done with old ones, and they imagine others do not do so. They cannot comprehend that the reason why a man who makes a good tool can afford to pay for advertising space in which to tell about it is that there are lots of people carrying on machine shops here and in other countries who are interested in knowing what improved machinery may be obtained, and what can be done with it in the way of improving products or reducing costs. These people are buying improved tools as fast as circumstances allow. If they were not doing so, it would of course, not pay to buy space in the advertising pages of this journal to tell them of these new machines and their advantages, and the inter-related facts mentioned have an important bearing upon the art and business of machine construction as carried on at this latter end of the nineteenth century. He who does not understand them and their bearing upon the situation he has to face is likely to experience what has been referred to as "a rude awakening."

It is a familiar fact that modern methods of doing lathe work, for instance, will in some cases reduce the time required to machine a piece of work by from 50 to 90 per cent; it is not so familiar, though equally true, that it makes quite a difference whether one adopts and makes full use of the best methods early in the game or waits until it is nearly played out, and prices based upon lower costs force him to improve.

Machine tools that are "as good as ever" must sometimes be gotten rid of and new shops, or those which are being enlarged, are by no means the only ones which should be large buyers of the most modern tools.—[American Machinist.

Testimony on Semi-Steel Castings.

Having had a good deal of experience in the making of semi-steel castings, E. H. Putnam says, in the *Tradesman*. "The fact is that a considerable per cent of steel, or wrought scrap, may be melted in the cupola with the cast iron and poured into most ordinary castings not only without detriment but with positive benefit in the gain in strength that it gives to all but very light castings. In plow castings a moldboard of perfectly white section in the fracture can be produced whose strength will be far greater than a merely white iron casting of the same pattern, resulting in a mold board that will wear much longer, and scour or shed the soil much better than a mold made of common gray iron. There is no difficulty to the expert founder in making semi-steel."

OPERATION OF BY-PRODUCT COKE OVENS.

In our issue of last week we gave the description of the new Semet-Solvay coke oven plant at Ensley, Ala., as presented before the American Institute of Mining Engineers at Buffalo, Oct. 19, by Wm. H. Blauvelt, of the Solvay Process Co., Syracuse, N. Y. The earlier portion of the same paper gives in brief space the distinguishing features of the retort by-product oven, and its departures from the bee-hive type. While some of the matter is not new, it is so succinct and clear an explanation of the operation of the retort oven and of the by-product apparatus that we give it in full:

The by-product retort oven was invented and developed on the continent of Europe, and was specially successful on account of the excellent results it obtained from the lean coals prevalent there, that were coked with difficulty, or not at all, in the bee-hive oven. In Europe the retort oven is used both with and without the saving of the by-products, although most of the recent plants include by-product apparatus.

The retort oven differs from the bee-hive in shape, in principle of operation and in results. As most of us know, the bee-hive oven is dome-shaped, about 12 feet in diameter, and 6 to 7 feet high in the center. The coal is charged through a hole in the center of the roof, and is leveled off in an even layer about 23 inches deep. The fresh charge is fired by the heat remaining in the walls from the previous charge, and the combustion is supported by air admitted through the front door, over the top of the charge. The volatile matter in the coal is driven off by the heat and burned in the top of the oven, along with a portion of the fixed carbon. The source of heat being at the top, the coking extends from above downward, with the formation of long finger-like pieces. The coke is quenched before it is drawn from the oven, thereby preserving the carbon glaze that has been thought so important in the blast furnace. Thus the process of coking in the bee-hive oven is effected by the partial combustion of the charge itself.

The retort oven is a long narrow chamber, from 30 to 35 feet long, about 6 feet high, and from 15 to 20 inches wide, depending on the quality of the coal that is to be coked. The charge is introduced through several openings in the top, and nearly fills the chamber, which is sealed tightly as soon as the surface of the coal is leveled. The ovens are built in blocks of from 25 to 30, and between each two ovens flues are arranged, in which gas is burned to supply the heat for coking the charge within the ovens.

This gas is a portion of what is driven off from the coal, and by its combustion with hot air a high temperature is readily maintained in the flues. The heat passes through the thin walls of the flues into the coal, which undergoes a true distillation, the volatile matter passing off without coming in contact with any air; consequently no combustion takes place. There is, however, a little breaking down of the hydrocarbons by the action of the heat, and a deposition of carbon that causes the retort oven to yield a higher percentage of coke than the theoretical, while the bee-hive oven yields less than the theoretical, owing to the partial combustion of the fixed carbon that takes place

As the supply of heat in the retort oven comes from the sides, the flow of the gases generated is from the sides toward the center, while the free expansion of the coke is somewhat checked. As a result, some coals that in a bee-hive oven make a coke that is too soft and spongy for blast furnace use, are hardened and strengthened in the retort oven, and are able to bear the furnace burden. Owing to the narrow oven and the different application of the heat, the time necessary to coke a charge is much less in the retort than in the bee-hive oven, the time varying with the coal and the type of retort oven from 18 to 36 hours for the former, instead of the usual 48 and 72 hours of the latter. When the charge in the retort oven is coked, doors at each end are opened and the charge is pushed out by a steam ram, and quenched as it leaves the oven. As soon as the ram is withdrawn the doors are closed, and the oven is ready for charging, with practically no loss of heat. The whole operation of discharging and charging an oven can readily be completed in 15 minutes.

By proper attention to the quenching, it is not difficult to keep the moisture in retort coke as low as in bee-hive coke. Its cellular structure causes coke to absorb moisture with

great readiness when cold, and a few days' exposure to the air in damp weather will often cause a gain of 10 per cent of moisture, or even more. It may be well to note here, however, that the usual laboratory methods for the determination of moisture in coke are quite inaccurate, and the results correspondingly unreliable.

Bee-hive coke can be produced with less moisture than the most carefully prepared retort oven coke, for it may for purposes of experiment be left to steam in the oven after quenching until practically dry; but after a few days' exposure to the air, it would not differ in moisture from properly quenched retort coke. In the retort oven without apparatus for saving the by-products, the gases distilled from the coal pass directly into the flues at the sides of the oven, where they are burned, the heat in excess of what is required for coking being used for raising steam. In the by-product plants the gases leave the oven through an opening in the top and enter a collecting main running along above the ovens. This is usually constructed on the principle of the hydraulic main of the illuminating gas works. The gas bubbles through water in this main, and part of the tar and ammonia are condensed out as the gas is partially cooled, and are collected and saved. From this hydraulic main the gas is led to tubular condensers, where it is cooled as thoroughly as possible by contact with a series of tubes through which cold water is flowing. By this second reduction of temperature more tar and ammonia liquor are separated. Then the gas goes to an exhauster, which delivers it to a final scrubbing apparatus, to remove the last traces of tar and ammonia. A portion of the gas, thus cooled and purified, is returned to the flues of the ovens, where it is burned, and the remainder, rather less than half, is available for various purposes. The tar collected from the several operations is pumped into tank cars ready for shipment, while the ammonia is concentrated into strong crude ammonia liquor, or made into sulphate of ammonia.

The amount of by-products obtained depends greatly on the quality of the coal. A short ton of coal will yield from 15 to 25 pounds of sulphate of ammonia and from 5 to 14 gallons of tar. The amount of gas produced also varies from the same cause, but it is usually from 8,000 to 11,000 cubic feet per ton of coal. Five thousand or 6,000 feet are needed to supply the necessary heat to the ovens, the waste heat from which furnishes just about enough steam to operate the plant. The remainder of the gas is available for any purposes for which natural gas can be used, although it is not so rich. It ordinarily contains from 600 to 700 B. T. U. per cubic foot, while natural gas contains about 1,000. As ordinarily made, the coke oven gas is of too low candle power to permit its use for illuminating purposes, as it averages from 10 to 12 candles. But by taking advantage of the well known fact that in the distillation of coals, the bulk of the illuminants and hydrocarbons come off in the first part of the operation and the hydrocarbon and carbonic oxide afterward, the distillation can be divided into two parts, a gas of from 16 to 19 candle power being produced and sold for illuminating purposes, and the poorer gas used for firing the ovens. A plant of ovens is now in operation which is furnishing without enrichment the whole amount of illuminating gas used in a city of some 40,000 inhabitants.

While the principles of operation are the same, there are two distinct types of retort ovens, viz., the vertical and horizontal flue types. In the former there are some 30 odd vertical flues in each wall between the ovens. These are connected at the top and bottom by larger horizontal flues running the length of the oven, the lower one being divided into two parts by a partition midway between the ends. The gas is burned in the lower flue, the flame rising through half the vertical flues and descending through the other half and escaping usually to regenerators of the ordinary reversing type, which heat the air for the combustion. The course of the gases is reversed about every hour, and sent through the flues in the opposite direction. In the horizontal flue oven the gas is burned in horizontal flues, usually three in number, which are connected at the ends so as to form a continuous system, the gas being admitted through small pipes at the ends of the top and middle flues, where it meets the air for the combustion. The gases travel from above downward, pass under the bottom of the oven, through a simple recuperative arrangement for heating the air, and then to boilers, where steam is made for operating the plant.

The ovens at the Ensley plant are of the Semet-Solvay horizontal flue type. In this oven the designers have developed the principle that the flue walls should be thin, to permit the ready passage of the heat to the coal, and that the weight of the top of the oven, which is necessarily thick and heavy to retain the heat, should be removed from the thin, almost white-hot flue walls, and carried independently. A solid fire brick wall, 18 inches thick, is therefore placed between each two ovens to carry the load of the roof, coal cars, tracks and whatever may be placed on it. Each oven, therefore, has its separate set of flues, which may be entirely removed if necessary without affecting the general structure; and, carrying no load, they are free to expand and contract with the changes of temperature incident to the introduction of the cold charge and its heating up to the point necessary to complete the coking process. Moreover, the thick brick walls form a reservoir of heat that is of considerable assistance in keeping the temperature of the oven uniform. Thus the design of the oven is such as to give a maximum life to the flues (which are the only part of the oven that can wear out), while at the same time it admits their ready repair, should it be necessary, without affecting any other ovens in the block.

The plan of introducing the gas in several places and at the ends of the horizontal flues gives perfect control over the heats in each flue, and permits their examination at any time to see that the proper temperatures are maintained. This arrangement insures that each flue shall have just the temperature best suited to the work to be performed, and prevents one part of the oven being overheated while another is too cool.

Flexibility of Mechanical Draft.

"Artificial draft," says Mr. W. S. Hutton, "can be readily adjusted to effect the combustion of different kinds of fuel at different rates of combustion. It permits efficient combustion of fuel of inferior quality, and enables a steady supply of steam to be maintained, independent of climate and weather. It enables the supply of air to be properly distributed to the fuel in the furnace to effect economical combustion. The supply of air above the fuel can be readily adjusted to effect combustion of the gases evolved by the fuel, and the supply of air below the fuel can be regulated to effect the combustion of the solid portion of the fuel, and the movement of the hot gases can be readily controlled."

There is no valuable feature of the chimney that is not possessed by the fan to at least the same, and in many cases to a more marked, degree. The very features which are most conducive to economy are those which are incidental to the use of the fan for draft production. While the recent extensive introduction of induced draft in stationary practice has done much to emphasize the advantages of this system, the general superiority of mechanical draft, properly applied, has long been recognized by those who have given careful consideration to the matter.—[Treatise on Mechanical Draft, publishe by the B. F. Sturtevant Co., Boston, Mass.

Papers on Iron and Steel Before Pittsburg Engineers.

The Engineers' Society of Western Pennsylvania held its regular scientific meeting Tuesday evening, Oct. 18, in the lecture room of the society's house, 410 Penn ave., Pittsburg. The paper of the evening was read by E. B. Taylor, superintendent of transportation on Pennsylvania Lines West of Pittsburg. The subject was "Transportation of Iron Ore." This was the first of a series of papers which will be read at the Engineers' Society during this and next year. The subjects of the other papers are as follows: "Manufacture of Pig Iron;" "Foundry Practice;" "Malleable Castings; "Wrought Iron Making;" "Bessemer Steel, Acid and Basic;" "Open Hearth Steel, Acid and Basic;" and "Crucible Steel." The authors of these papers will be well known authorities in each branch; and it is expected that the series will be one of the most valuable ever published on the subject of iron manufacture. Mr. Taylor's paper contained a great deal of valuable statistical information and was illustrated with numerous drawings, blue prints, and photographs of docks and machinery used in handling the ore.

THE MELTING POINT OF CAST IRON.*

BY DR. R. MOLDENKE.

In the rapid development of the art of founding into a distinct division of a great branch of applied science, one point seems to have escaped general research, not because it was not recognized, but because the proper appliances were lacking. This is the question of melting and casting temperature, a question all foundrymen deal with daily, which, for some branches of the art, means either a successful cast or an utter failure.

The question of whether silicon affects the condition of the carbon contents of a casting or not is coming up again, as it does periodically, analyses by the dozen being quoted to substantiate statements made on either side, and yet we see only an occasional statement that the temperature conditions were as nearly the same as possible. What proof is there of this? The writer has taken the temperature of a ladle of iron which to the eye seemed as hot as melted steel, and yet another ladle full of iron of a different composition, which was dull red, contained the hotter metal of the two. Again from the same tap differences in temperature were found running nearly 200 degrees F. The castings made with the two extremes in this case, though of the same silicon contents, differed widely in the proportion of graphite to combined carbon for the same thickness of section.

No wonder we are told that the silicons do not play so important a part. In one of the determinations described later on, a piece of cast iron was placed side by side with some ferro-chrom, both being under the same cupola conditions. The comparatively thick piece of cast iron heated quickly and melted before the thin piece of ferro-chrom, though showing the melting heat of the iron, was thoroughly red hot. Thus it will be seen that the eye is no criterion of the degrees of heat present when they get into the high ranges.

Those who cast heavy work know the danger of pouring either too hot or too cold, and many are the devices made use of to test the heat of a ladle full of melted iron. Since these methods are empirical at best, how will we know at least approximately the temperature of our melt? Only by a device capable of withstanding such a severe usage. In looking about for such an instrument the attention of the writer was naturally directed to the latest and admittedly the best form of a pyrometer for very high temperatures, the Le Chatelier. This consists essentially of two pieces of wire of a slightly varying composition, a heating of the junction of which produces a current of electricity proportioned to the degrees of heat applied. The amount of this current is measured by a suitably calibrated galvanometer, and thus we can read off the heat at any convenient distance rapidly and with a surprising degree of accuracy.

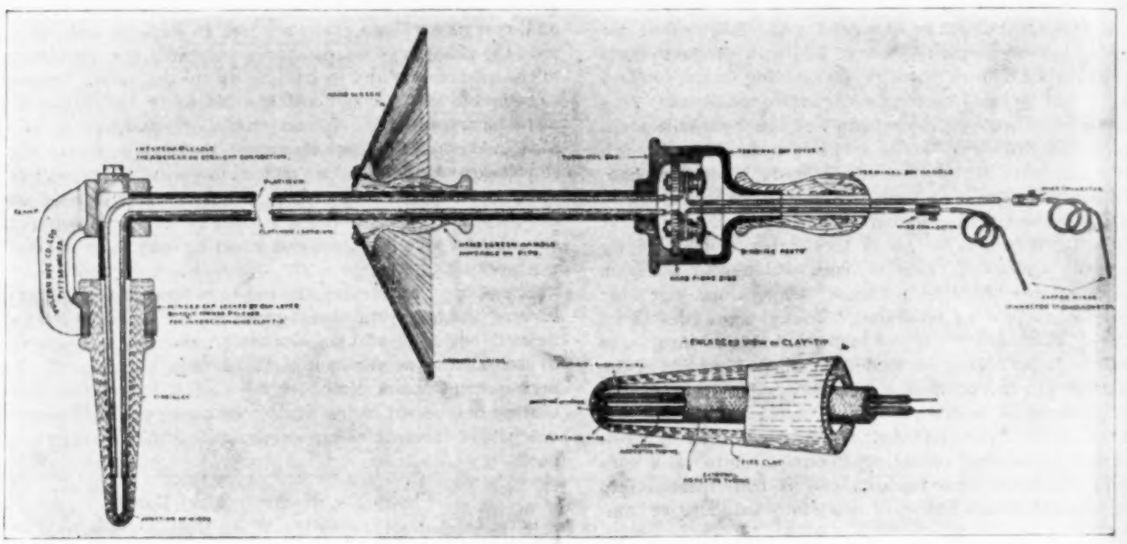


FIG. 1.—SECTION THROUGH PYROMETER.

Unfortunately, this wonderful instrument, one wire of which is of platinum, the other of an alloy of platinum and 10 per cent of the rare metal rhodium, cannot be immersed directly in the melted iron—there would soon be an end to this expensive thermo-couple. The long porcelain tube which protects it when used in kilns is worse than useless in a ladle full of metal, and so at the suggestion of the writer the Pittsburg representatives, the Vulcan Mfg. Co., set about to remedy the matter and devise some protective cover which would allow experiments of this kind to be carried out readily. The outcome, while not having the advantage as yet of an extended period of trial, was nevertheless so happy a solution that it is presented to-night for the first time and to the Pittsburg Foundrymen's Association with the hope that much of value may be learned with it, not only in our daily work, but also in connection with the many intricate problems still before us which await solution at the hands of those willing to give their time and energy to such an exacting study.

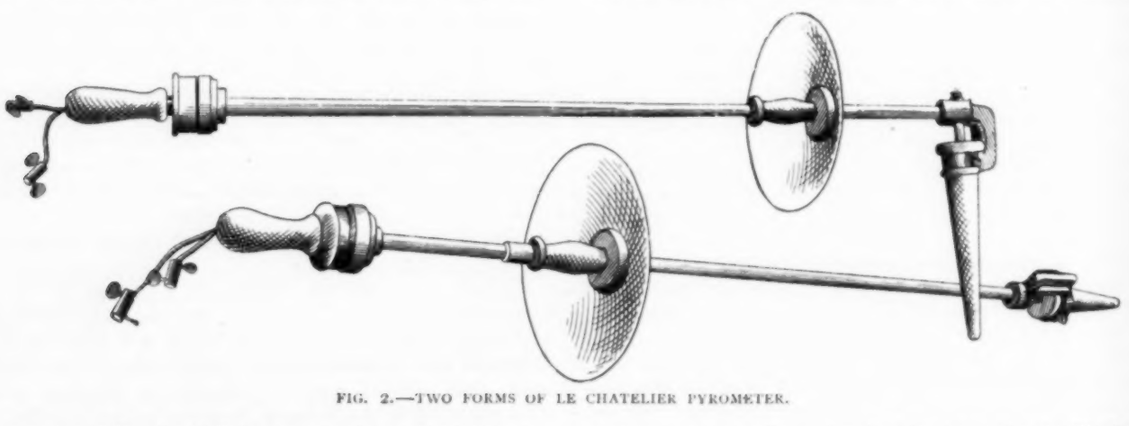


FIG. 2.—TWO FORMS OF LE CHATELIER PYROMETER.

Fig. 1 shows a section through the instrument. The plati-

* Read before the Pittsburg Foundrymen's Association, October, 24, 1898.

num wire will be noticed running from the the terminal box through an iron pipe ending at the inner side of the point of the clay tip. Here is the button made by the fusion to the other wire of platinum and rhodium alloy which runs back, parallel to the platinum wire, to the terminal box. Both wires are covered with asbestos to insulate them from each other and from the iron frame as well as to serve as a protection in case the tip breaks while in the molten iron. The interchangeable connection holding the clay tip allows it to

FIG. 3.—METHOD OF USING IN LADLE.

point out straight for use in small ladles or in experimenting, or it may come down at right angles for taking temperatures in large ladles full of metal. A third form, not completed in time for illustration purposes, has a ball and socket joint which allows the tip to stand out at any angle. A movable shield lined with asbestos protects the hand.

Fig. 2 shows two of the styles of the pyrometer, and Fig. 3 the method of using the angular form. In the terminal box are placed the connections which allow wires of any convenient length to run through the handle and connect with the galvanometer. The galvanometer itself is a "D'Arsonville," specially gotten up and calibrated for industrial purposes. The original form with the reflecting mirror, and capable of reading to one-half of a degree at these high temperatures, was found too cumbersome and delicate for factory use.

The sensitiveness of the couple, even though protected by a refractory material, is such that plunging it cold into the melted iron the correct reading is obtained in one minute and three quarters. When properly heated up to redness beforehand, however, this time is reduced to not many seconds.

It would be beyond the scope of this paper to show the many uses to which such an instrument can be put in the steel and iron trade. On the question of annealing alone it will pay for itself in a short time, and when its capabilities in foundry practice come to be investigated and generally understood, one more safeguard will be added to those already helping us to increase the efficiency of our plants.

We come now to the subject matter itself. You will all remember the recent discussion on the melting of white and gray irons, Mr. West's elaborate experiments confirming our daily experience. Yet the correctness of the conclusions were questioned, and while the peculiar phenomena observed in the behavior of carbon with iron make any positive statements rather hazardous, yet the melting down of a lump of iron, and taking its temperature while doing so, should stand as a final determination of its melting point as viewed from the entirely practical side of the question. This is the consideration we have to deal with daily in cupola and furnace.

The material experimented with was gathered for several years, some of it being furnished by Mr. Jos. Seaman, Mr. Thos. D. West and Mr. J. E. McDonald, members of this association, and the especially interesting alloys by Mr. R. McDonald, of the Crescent Steel Co.

There were 48 pig irons, embracing both foundry and Bessemer brands as well as softeners, made with coke and with charcoal, both cold and warm blast. Seven of the cast irons were of the shape seen in Fig. 4, being melted right from the tip. The balance of the 15 specimens were of the sand and chill rolls made by Mr. West in his recent experiments. Two steels and nine alloys of chromium, tungsten and manganese with iron, complete the list of 73 specimens.

The melting was done in an assay furnace converted for the time into a cupola. Fig. 5 gives a front view of it while in full operation. A jet of steam entering the stack in the side near the top induced the blast, the air being drawn in all around the bottom. In this form it is really the "Herberz" cupola of European fame and excellent for small diameters. A hole was broken into the wall just below the charging door, which must be kept closed when not used. This hole allows the introduction of the pieces of pig iron, etc. After heaping up enough coke to last for some time, the piece of pig iron (of full section and about five inches long), was driven into the bed, surrounded by incandescent coke and the opening closed with a tile. After it was red hot the tile was removed, the pyrometer inserted and pushed against the center of the pig where the borings were taken for the analysis. The temperature as registered by the pyrometer rose rapidly, then more slowly, remaining stationary while the iron melted slowly. Then as the point finally became uncovered the temperature jumped up, going above 2,600 degrees F. In this way the results noted in the tables below were obtained.

It took much patience, a loss of a few samples, and a number of broken tips to accomplish all this, but on the whole the results given are as good as could be gotten under the conditions prevailing. The coke burning up would let the iron drop a little, and a failure

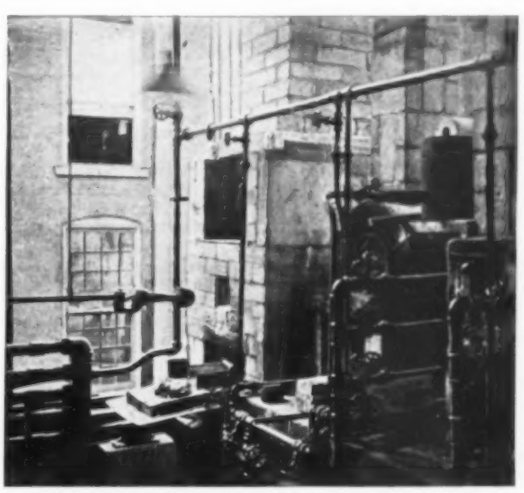


FIG. 4.—FOR MELTING POINT OF CAST IRON—SIDE VIEW.

to adjust the pyrometer to suit (the opening being closed by a piece of sheet iron, to prevent undue cooling by air drawn in), meant a break in the tip, which, while not affecting the results, caused subsequent delay and trouble.

The following general observations were made: The white

irons held their shape, the iron running from the sides and bottom freely, leaving smooth surfaces. The gray irons became soft, dropped in lumps, leaving a ragged surface. Ferro-manganese samples became soft and mushy, exhibiting a consistency of putty before finally running down. Ferro-tungsten behaved in the most marked way. As it melted it acted like white iron, but instead of chilling quickly it ran through the coke, coming down the spout in thin streams like white hot quicksilver, only setting after collecting in a pool in the pan of sand.

The cupola was fluxed heavily with fluor spar to take care of the ash, for it was a case of a furnace full of incandescent coke and only one piece of iron in it. The following tables give the results:

TABLE 1.—PIG IRONS.

No.	Melting Point.	Combined Carbon.	Graphite.	Silicon.	Manganese.	Phosphorus.	Sulphur.
1	2030°F.	3.98	.....	.14	.10	.220	.037
2	2040	3.90	.....	.28	.11	.216	.044
3	2040	3.74	.74	.38	.16	.172	.032
4	2070	3.70	.....	.26	.19	.198	.033
5	2100	3.52	.54	.47	.20	.200	.036
6	2040	3.48	.....	.36	.09	.240	.040
7	2055	3.22	.68	.71	.09	.142	.038
8	2010	3 21	.20	.45	.18	.198	.037
9	2110	2.28	1.14	.42	.13	.185	.026
10	2140	2.27	1.80	.45	1.10	1 465	.032
11	2150	2.24	1.58	.42	.16	.415	.045
12	2170	1.96	1.90	.75	.63	.097	.028
13	2170	1.93	1.69	.52	.16	.760	.036
14	2170	1 87	1.85	.56	.45	.713	.027
15	2150	1 84	1.95	.56	.34	.175	.022
16	2190	1.72	2 17	1.88	.24	.446	.028
17	2200	1.69	2.40	1 81	.49	1 602	.060
18	2230	1.54	2 08	2 02	.39	.632	.062
19	2190	1 49	2.26	2.54	.50	.349	.038
20	2210	1.48	2.30	1 41	1 39	.168	.033
21	2190	1.47	2.63	.89	.48	.164	.037
22	2190	1 36	2.41	1.65	.32	.160	.038
23	2210	1.31	2.70	1.25	.76	.170	.022
24	2210	1.31	2 40	1.69	.46	.085	.039
25	2230	1.24	2.68	.65	.26	.201	.020
26	2230	1.23	2 70	1.20	.37	.299	.022
27	2230	1.12	2.66	1.13	.24	.089	.027
28	2200	.90	3.07	1.09	.33	.176	.014
29	2230	.87	3.10	1.34	.42	.158	.030
30	2210	.84	3.07	2.58	.47	2.124	.051
31	2260	.83	3 26	1.97	.59	.210	.018
32	2230	.80	3.22	1.30	.59	.172	.042
33	2250	.80	3.16	1.29	.50	.218	.020
34	2250	.80	2.89	2.21	.25	.411	.041
35	2250	.67	3.60	1 32	.20	.205	.020
36	2240	.59	3 15	1.50	.61	.094	.033
37	2230	47	2 84	2.19	.65	1.518	.042
38	2250	.38	3.43	2.44	.57	.422	048
39	2250	.35	3.44	2.07	.28	.448	.039
40	2260	.35	3 70	3.29	.82	.501	.038
41	2260	.24	3.48	2.54	.30	.060	.020
42	2280	.13	3.43	2.40	.90	.084	.032
			SOFTENERS, FERROSILICONS, AND SILICO SPIEGEL.				
43	2190		3.38	.37	12.30	16 98	
44	2040		1.82	.47	12.01	1.38	
45	2090		2.17	.72	10 96	1.34	
46	2155		1 35	1.60	9 40	.32	
47	2145		1.57	1.36	8 93	.39	
48	2170		1.77	1.80	4 96	.39	

TABLE 2.—CAST IRONS.

No.	Melting Point.	Com. Carbon.	Graphite.	Silicon.	Manganese.	Phosphorus.	Sulphur.	Remarks.
49	2000°F.	4.67	.03	.57	.22	.266	.044	Cast into chill roll (Mr. West).
50	1990	4.20	.20	.63	.33	.254	.040	" " "
51	2010	4.08	.....	.89	.06	.287	.040	" dry sand.
52	2000	3.90	.16	.75	.66	.240	.030	" chill roll (Mr. West).
53	2030	3.62	....	.72	.14	. 93	.026	" dry sand.
54	2030	3.48	.....	.47	.09	.190	.032	" "
55	2040	3.40	.....	.42	.07	.196	.029	" "
56	2170	1.63	2.27	1.46	.50	.092	.032	" "
57	2210	1.60	3.16	.59	.25	.271	.048	No. 48 in sand rolls (Mr. West).
58	2250	1.57	4.90	.66	.31	.237	.040	No. 49 " " "
59	2240	1.22	2.16	1.69	.47	.274	.037	Cast into dry sand.
60	2250	1.20	2.91	.75	.66	.248	.030	No. 51 in sand rolls (Mr. West).
61	2260	.17	3.57	2.09	.43	.272	.042	Cast into green sand.
62	2080	1.98	1.28	11.64	.98	.....	.....	Remelted ferro-silicon No. 5, cast into chill roll (Mr. West).
63	2080	1.81	1.36	11.70	1.00	.....	.....	Remelted ferro silicon No. 5, cast into sand roll (Mr. West).

For a better comparison of the melting points of the same irons cast into sand and into chills, as made by Mr. West, the following table is subjoined:

TABLE 3.

No.	Combined Carbon.	Graphite.	Fracture.	Melting Point.	
57	1.60	3.16	Gray	2210°F.	same ladle.
49	4.67	.03	White	2000	
58	1.57	2.90	Gray	2250	same ladle.
50	4.20	.20	White	1990	
60	1.20	2.91	Gray	2253	same ladle.
52	3.90	.16	White	2000	

TABLE 4.—ALLOYS AND STEEL.

No.	Melting Point.	Carbon.	Silicon.	Manganese.	Chromium.	Tungsten.	Remarks.
64	2450°F.	1.18	.21	.49	.....	.....	Steel.
65	2 50	1.32	.29	1.27	3.40	6.21	Steel.
66	2280	.....	.....	.....	.....	39.02	Ferrotungsten.
67	2240	.....	.....	.....	.....	11.84	Ferrotungsten.
68	2255	5.02	1.65	81.40	.....	.....	Ferromanganese.
69	2210	6.48	.14	44.59	.....	.....	Ferromanganese.
70	2400	6.80	.....	.....	62.70	.....	Ferrochrom.
71	2230	6.40	.....	.....	19.20	.....	Ferrochrom.
72	2260	1.20	.....	.....	19.10	.....	Ferrochrom.
73	2180	1.40	.....	.....	5.40	.....	Ferrochrom.

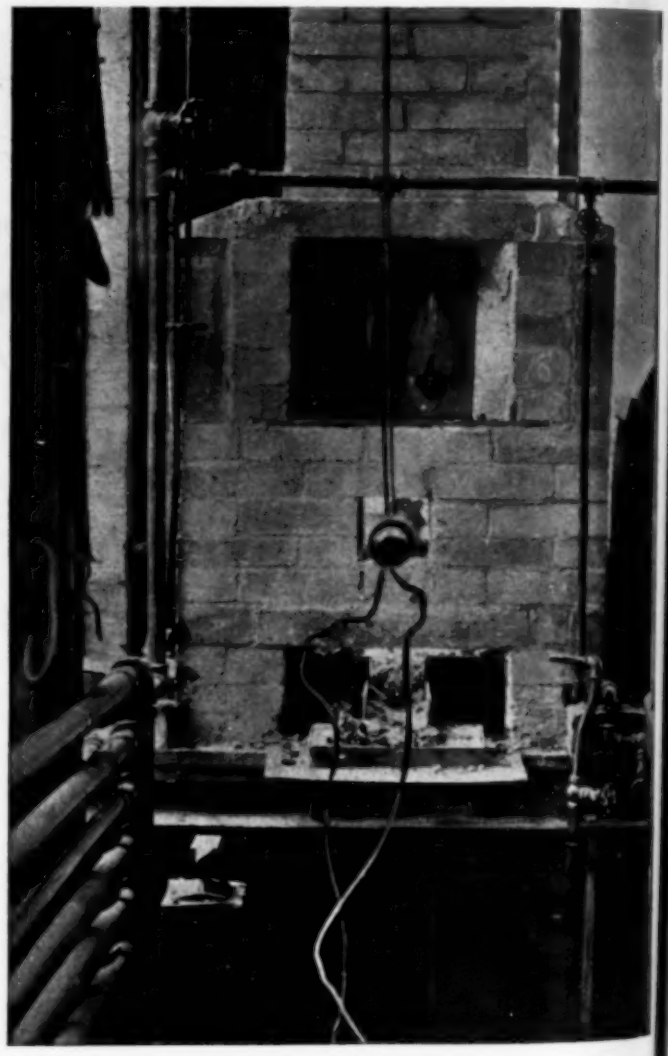


FIG. 5.—FOR MELTING POINT OF PIG IRON—FRONT VIEW.

The tables of the pig and cast irons have been arranged according to their combined carbon contents, for it is evident that with few exceptions the melting points increase as the combined carbon goes down, this being the case independent of the amount of graphite present. One could hardly expect anything else for that matter, gray cast iron being really a steel with a lot of mechanically mixed graphite, and white iron a combination of carbon with iron Alloys melt at a lower temperature than any of their constituents, and so also white iron, really an alloy of carbon or some carbides of iron with iron, should melt sooner than the purer iron in the gray variety.

The fact, however, that steel melts at a much higher temperature than the grayest of irons in the table, shows that there are other considerations not to be overlooked in studying the molecular physics of cast iron. The principal reason for this lowering of temperature is the supposed solution of the graphite ir the iron before actual melting takes place. To what extent this occurs and under what circumstances is not known, but may account for the difference in the melting points of steel and gray iron.

Again, in melting steel in the cupola, commercially, an absorption of carbon from the fuel takes place, the melting point is doubtless lowered a little, and the results obtained are tangible, even though care must be taken to get the whole of the charge down before pouring. In the air furnace the steel absorbs carbon by contact with the pig iron charged and melts off, the wasting of wrought iron or steel poking bars used for rabbling giving evidence of this occurrence.

The writer is especially pleased to see the full corroboration of Mr. West's elaborate experiments with the melting of white and gray irons. The contrast is remarkably sharp, and on the whole it shows us that science and practice go hand in hand admirably, no matter what the field may be. Whatever theories may develop regarding the melting of iron, whatever the effect of high or low phosphorus, silicon, manganese and sulphur, may be shown to be on the melting point of an iron eventually (the present series of irons not being well enough adapted for this phase of the question), the results here given are, it is hoped, of sufficient value to stimulate further research of practical value to the founders of cast iron.

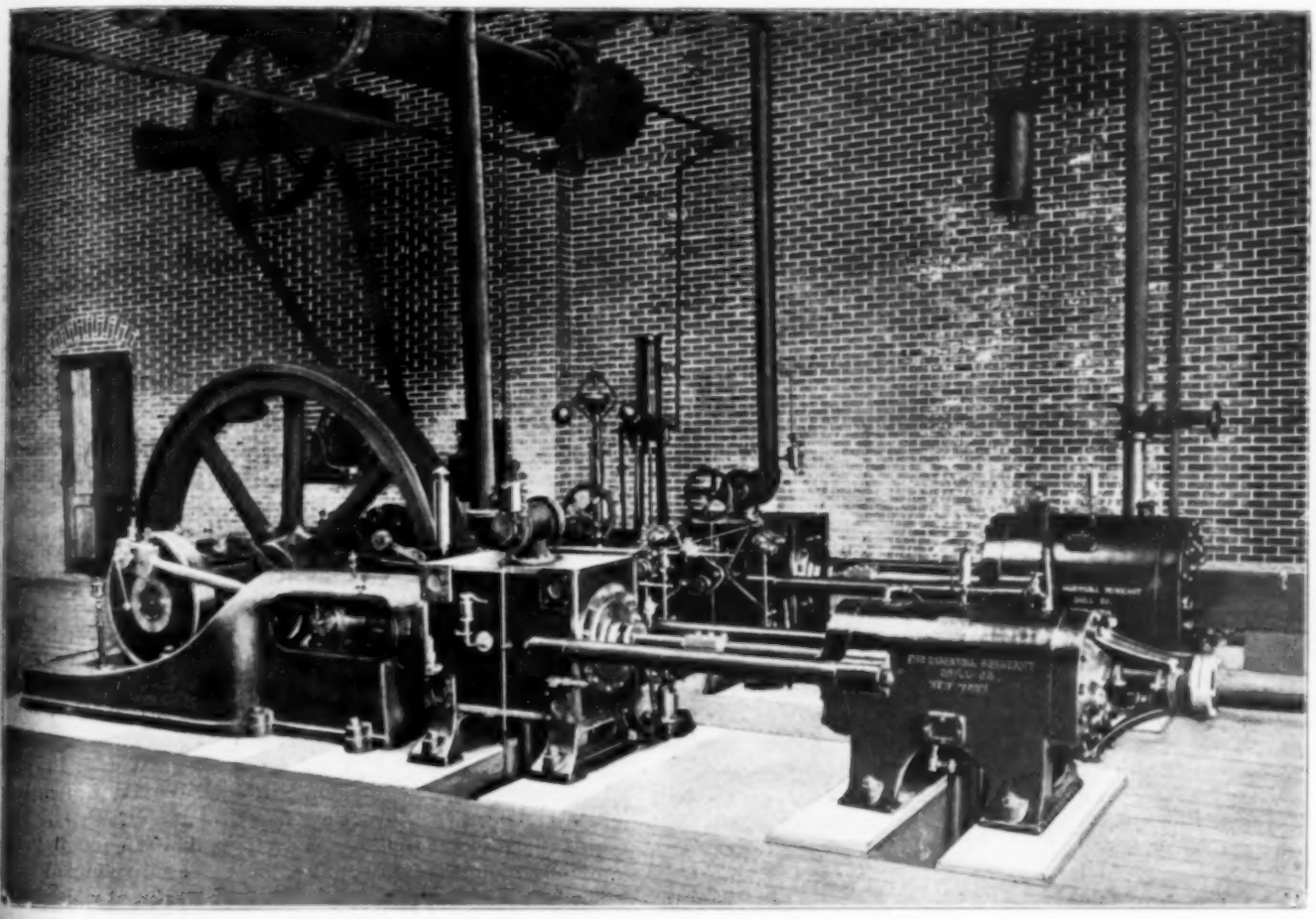
THE Michigan-Peninsular Car Co. reports earnings for the fiscal year ending Aug. 31 of $670,877, against $176,688 during the previous year. Deducting fixed charges of $100,000, there were paid in dividends $300,000 and $50,000 respectively, leaving as a surplus of the two fiscal years $270,877 and $26,668 respectively.

DISPATCHES from Dubuque, Ia., report that the Iowa Iron Works are building six steel hulls for the United States Government, to be used for steam tenders in river service. The same company is finishing the steel hull of a passenger steamer for Natchez (Miss.) parties. An electric light plant is being installed at these yards, so that a night force can be put on.

AIR COMPRESSOR IN BRIDGE WORKS.

The Lassig Bridge & Iron Works, at Chicago, are about to discard all line shafting in their entire plant and operate all tools either by compressed air or electricity, each doing the work for which it is best adapted. The electric equipment consists of a 200-kilowatt generator which supplies the current necessary to operate motors driving the following tools: 26 punch presses, one plate roll, one bending roll, four batteries of radial drills carrying 45 bits, for holes 11-16 inch to 1⅛ inches; four cranes, one milling machine, one link boring machine, one derrick, one paint mixer, one radial drill, one pair emery wheels.

The compressed air plant shown in the accompanying engraving, for which we are indebted to the *Railway Age*, has just been installed by the Ingersoll-Sergeant Drill Co., and consists of a duplex Corliss air compressor, with two-stage air end, and with a maximum free air capacity of 2,200 cubic feet per minute compressed to 80 pounds. The tools and appliances operated by compressed air include 15 11x9 inch riveters, six rotary drills, six pneumatic hammers, four rivet furnaces, and 36 oil-heating furnaces.



AIR COMPRESSOR IN BRIDGE WORKS.

A pair of simple Corliss engines of very heavy pattern constitute the steam end of the compressor. The dimensions of the steam cylinders are 20 inches diameter by 30 inches stroke. The cranks are set at right angles. The air end is of the piston inlet type, the air being compressed in two stages. The low-pressure air cylinder is 30¼ inches in diameter by 30 inches stroke, and the high-pressure air cylinder 18¼ inches diameter by 30 inches stroke.

To provide an efficient system of cooling the air between the two compressions, an intercooler of the receiver type is provided, with capacity to fill the second or high-pressure air cylinder without any drop in pressure. The inter-cooler, which is 42 inches in diameter by 11 feet high, receives the air from the low-pressure cylinder, the air entering at the top and passing down through a nest of 1-inch tinned brass tubes, placed close together and dividing the stream of air up into thin sheets. Water circulates through the system of tubes, from below upward, and the air which comes into the low-pressure cylinder at a temperature of about 240 degrees is reduced to the temperature of the surrounding atmosphere before it enters the high-pressure cylinder. In order to maintain a practically constant air pressure at 80 pounds, a very sensitive regulator handles the Corliss valve mechanism, causing an earlier or later cut-off as the pressure rises or falls, thus varying the speed of the engine to meet the requirements of the air consumption.

BUFFALO MEETING OF MINING ENGINEERS.

The 75th meeting of the American Institute of Mining Engineers began at Buffalo, Tuesday evening, Oct. 18. The attendance was fair, about 75 members being present and nearly as many visitors. At the opening session, in the new Public Library building, T. Guilford Smith, of the local reception committee, greeted the members, and they were further welcomed by Mayor Diehl, President Park, of the society of Natural Sciences, and Andrew Langdon, president of the Historical Society. President Chas. Kirchhoff, of the Institute, responded. The uses to which the Library building is put were explained in connection with the opening addresses. Noteworthy among these is the practice of bringing pupils in the schools, by classes and by rooms, to the building, giving them the benefit of its excellent collections, and of demonstrations by persons well equipped in various sciences.

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In this practical age it will be asked, "What is the actual value of all this, and is it worth while to bother any more about it?" The answer is that already the steel maker depends more and more every year on the very points that we have been discussing, and the engineer should know what he is doing when he uses both chemical and physical limits in his specifications. Is it to be wondered at that to-day we have specifications in which the chemical requirements do not at all agree with the ultimate strengths specified? This in the ordinary home orders may make very little difference, as it is an easy matter to investigate and make proper modifications required, but in specifications from foreign railroads or engineers at a distance, for material on export orders, it is a very different matter. There is no time to refer questions of this kind, and the inspector is sometimes forced to condemn material that he knows from experience is all right. It may give better physical tests than were called for but not conform to the chemical requirements in the particular specifications in question, though it would meet both the physical and chemical requirements of our leading engineers and railway companies in this country. Some of these foreign specifications are so worded, and the requirements are such, that it is not safe for an American manufacturer to bid on the orders. This may be due in part to their not understanding all of the conditions under which the tests are to be made. In other cases it seems as though modifications must have been made on previous orders, either in the chemical requirements or physical tests called for, as no steel was ever made that would meet all the requirements of chemical and physical tests in some such specifications.

Many export orders for rails call for phosphorus not over .06 per cent, while the sulphur is allowed a much higher limit, or not specified at all. This low phosphorus cuts out several of our largest steel works, whose material will meet all of the physical tests called for, being low in sulphur and under .10 per cent phosphorus, and giving entire satisfaction to our leading engineers and railroad companies. The foreign manufacturers of basic Bessemer steel and low phosphorus acid Bessemer steel are working the low phosphorus clause for all it is worth, just as our manufacturers would do under similar circumstances; but we, as engineers, want to know if there is any good reason for this distinction, which is made on account of local conditions, and if the high sulphur is not as undesirable as the phosphorus would be up to the limit of .10 per cent usually allowed in this country?

This is a matter that should be thoroughly discussed and on which opinions should be secured from our leading engineers; for it is of no use for the manufacturers to give their opinion unsupported by the experience of users of their rails. It is just here that the effect of the different elements plays an important part. Our manufacturers know from experience that as their phosphorus is a little higher than the limit of .06 per cent referred to, they must keep the other elements inside of given limits to produce the best results in the finished rails. This is done successfully, and a rail is produced that will meet the requirements of the drop test and give satisfaction in use. I do not wish to be understood as advocating high phosphorus, but my position is, that rails which will meet all of the varying conditions in this country will meet all that is required of them when put in use in other countries. If one examines the methods of manufacture of rails in this country and those in other countries, then visits the countries where our rails are being introduced, and gets accurate information as to the service they are giving, he will be convinced that there is a great future for America in the export business in rails.

The conditions with regard to the material for bridges are about the same. Foreign specifications, in many cases, provide that only acid open-hearth steel can be used. This has already prevented our bridge builders from bidding upon thousands of tons of bridge work, although in some cases they have accepted the requirement of acid open-hearth steel, and have taken the orders. In other cases they have explained that our Government is using the basic open-hearth steel; that in the manufacture of it the works here start with an iron very much lower in phosphorus than is ordinarily used, and that the resulting steel is much more uniform. This has had a great deal of weight, and the use of basic steel has been allowed in some cases. In other cases new specifications have been adopted after investigation in accordance with the best American practice, which allows the use of either basic or acid open-hearth steel. I refer to this matter at length, as it is of the greatest importance to our engineers and manufacturers, as well as to all others who wish to see our export trade developed.

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In this practical age it will be asked, "What is the actual value of all this, and is it worth while to bother any more about it?" The answer is that already the steel maker depends more and more every year on the very points that we have been discussing, and the engineer should know what he is doing when he uses both chemical and physical limits in his specifications. Is it to be wondered at that to-day we have specifications in which the chemical requirements do not at all agree with the ultimate strengths specified? This in the ordinary home orders may make very little difference, as it is an easy matter to investigate and make proper modifications required, but in specifications from foreign railroads or engineers at a distance, for material on export orders, it is a very different matter. There is no time to refer questions of this kind, and the inspector is sometimes forced to condemn material that he knows from experience is all right. It may give better physical tests than were called for but not conform to the chemical requirements in the particular specifications in question, though it would meet both the physical and chemical requirements of our leading engineers and railway companies in this country. Some of these foreign specifications are so worded, and the requirements are such, that it is not safe for an American manufacturer to bid on the orders. This may be due in part to their not understanding all of the conditions under which the tests are to be made. In other cases it seems as though modifications must have been made on previous orders, either in the chemical requirements or physical tests called for, as no steel was ever made that would meet all the requirements of chemical and physical tests in some such specifications.

Many export orders for rails call for phosphorus not over .06 per cent, while the sulphur is allowed a much higher limit, or not specified at all. This low phosphorus cuts out several of our largest steel works, whose material will meet all of the physical tests called for, being low in sulphur and under .10 per cent phosphorus, and giving entire satisfaction to our leading engineers and railroad companies. The foreign manufacturers of basic Bessemer steel and low phosphorus acid Bessemer steel are working the low phosphorus clause for all it is worth, just as our manufacturers would do under similar circumstances; but we, as engineers, want to know if there is any good reason for this distinction, which is made on account of local conditions, and if the high sulphur is not as undesirable as the phosphorus would be up to the limit of .10 per cent usually allowed in this country?

This is a matter that should be thoroughly discussed and on which opinions should be secured from our leading engineers; for it is of no use for the manufacturers to give their opinion unsupported by the experience of users of their rails. It is just here that the effect of the different elements plays an important part. Our manufacturers know from experience that as their phosphorus is a little higher than the limit of .06 per cent referred to, they must keep the other elements inside of given limits to produce the best results in the finished rails. This is done successfully, and a rail is produced that will meet the requirements of the drop test and give satisfaction in use. I do not wish to be understood as advocating high phosphorus, but my position is, that rails which will meet all of the varying conditions in this country will meet all that is required of them when put in use in other countries. If one examines the methods of manufacture of rails in this country and those in other countries, then visits the countries where our rails are being introduced, and gets accurate information as to the service they are giving, he will be convinced that there is a great future for America in the export business in rails.

The conditions with regard to the material for bridges are about the same. Foreign specifications, in many cases, provide that only acid open-hearth steel can be used. This has already prevented our bridge builders from bidding upon thousands of tons of bridge work, although in some cases they have accepted the requirement of acid open-hearth steel, and have taken the orders. In other cases they have explained that our Government is using the basic open-hearth steel; that in the manufacture of it the works here start with an iron very much lower in phosphorus than is ordinarily used, and that the resulting steel is much more uniform. This has had a great deal of weight, and the use of basic steel has been allowed in some cases. In other cases new specifications have been adopted after investigation in accordance with the best American practice, which allows the use of either basic or acid open-hearth steel. I refer to this matter at length, as it is of the greatest importance to our engineers and manufacturers, as well as to all others who wish to see our export trade developed.

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

The Eastern Moline Plow Co., Moline, Ill., capital stock $50,000, has been incorporated by G. A. Stephens, F. G. Allen, and C. R. Stephens.

The Pope Mfg. Co., of Hartford, Conn., is in the market for about $50,000 worth of machinery to be placed in a plant which it is to establish. abroad Lathes, milling machines, gear cutters, upright drills and other machine tools will be wanted in large quantities.

The Frantz-Body Mfg. Co., of Akron, O., has been incorporated for $60,000 to manufacture vehicle parts. The incorporators are: F. X. Frantz, J. F Diehm and L. H. Cassellman.

The Clinton (Ia.) Boiler Works have incorporated; capital, $10,000. J. T. Cullen and D. J. Murphy are directors and incorporators.

Johnstown, Pa., board of trade has acted favorably on a proposal to locate a brass manufacturing plant.

Chauncey Castle, of Quincy, Ill., will start up the old Keokuk, Ia., foundry. Keokuk people will furnish $10,000 for repairs to building, for flasks patterns, machinery, etc. Stoves will be made and from 40 to 70 men employed.

The Frank Machinery Co., of Buffalo, has been incorporated with capital of $10,000. Directors are: Oliver S. Garretson, of Buffalo, and two others.

The Cheney Mfg. Co., Athol, Mass., has been incorporated by H. M. Slate, C. A. Bacon and C. W. Cheney, to manufacture the Cheney duplex heat and fuel saving regulator. A shop will be started in Athol to manufacture it.

The Co-operative Stove Co. recently organized at Wheeling is building a new plant for the manufacture of the Ohio Valley Star stove, first made by the Fisher Foundry Co. The new concern is made up largely of men employed in the old Fisher foundry.

The C. Howard Hunt Co., of Camden, N. J., has been incorporated to manufacture steel pens and has let to B. F. Sweeten & Son the contract for its plant at $18,785.

Marcus Mason & Co, of New York, have been incorporated to manufacture machinery. Capital $100,000. Directors: J. Dobson Good, of East 44th st., New York, and two others.

New Construction:—

The Utica Belt Line Railroad Co., Utica, N. Y., is erecting on the line of its road a new riveted lattice bridge, having a span of about 75 feet. The bridge is known as the Half-way Bridge. It is a modern structure in every way. It is to be all steel except the cross ties on which the rails rest. The Berlin Iron Bridge Co., East Berlin, Conn., has the contract for furnishing and erecting the steel work.

The Southern Pacific Railroad will build a pattern shop in Sacramento, Cal. The building will be 64x145 ft., of brick on pile foundation, two stories.

The Reeves Machine Co. will build a new two-story brick machine shop at Trenton, N. J. The main building will be 44x80 feet.

At Bellaire, O., Anderson Bros. & Simpson will build a foundry and machine shop on the site of their burned plant.

James Stewart & Co., engineers and contractors Buffalo, have the contract for six buildings for the Lawrence Cement Co., of Pennsylvania, at Siegfried, Pa. They consist of a kiln building, 120x126; mill building, 63x285; engine building, 75x105; boiler house, 42x105; stock house, 120x462, and fuel building, 50x60. The buildings will be of brick, with steel columns and roof trusses.

The Elwood Mfg. Co., Elwood, Ind., is building a new machine shop, of brick, with wood frame. The main building is to be 40x200 feet, with two other buildings 50x170 feet each. The buildings are to be two stories. The equipment is not fully decided upon, but will include machine tools for general manufacturing and special tools for making the Dadso nut lock, Brown gas engine and Haylett tubular boilers. The contractors are Pulse & Harris, Anderson, Ind. The Elwood Mfg. Co. will buy the material.

Additions, Enlargements, Removals, Etc.:—

The St. Louis (Mo.) Iron Works will enlarge their plant and the work on two extensive additions has been commenced. One, 45x62 feet, will consist of two stories, the lower floor to be converted into an office and warerooms, the upper floor to be used as pattern rooms. A one-story addition, 48x62 feet, will be occupied as a machine shop.

The Ferracute Machine Co., Bridgeton, N. J., manufacturer of presses and dies, is enlarging its plant. It has just built a larger office and stock room, and added a new bay, 66x16 feet, to the erecting room, and placed in it a 6-ton traveling crane. The company has also purchased recently some new machine tools in the way of grinding and drilling apparatus, etc. It has a large number of orders in hand, and is running about 140 men, and the prospects are good for trade during the fall and winter.

The Union Dry Dock Co., Buffalo, N. Y., will enlarge its punch shed and machine shop to about twice its present capacity, providing for electric and pneumatic tools, besides a new electric crane, furnished by the Wellman-Seaver Engineering Co., of Cleveland. The new machine shop will be 110x400 feet and will be completed by Jan. 1.

The C. H. Dutton Boiler Co., Kalamazoo, Mich., has let the contract for a new boiler shop, a much larger building being necessary on account of the increase in business.

The Union Iron Works and Reid Machine Co., of Spokane, Wash., have consolidated. The plant will be enlarged and they will manufacture mining and electrical machinery.

The Union Drawn Steel Co., Beaver Falls, Pa., is planning extensive additions and has asked the city council to vacate a portion of a street to give needed room.

Further extensions to the plant of the Schoen Pressed Steel Co., Pittsburg, are contemplated. Plans have been drawn for the building of a blacksmith shop and paint shop. The building will be 250x75 feet, and will be of steel. It will be erected by the Riter-Conley Mfg. Co.

Fires and Accidents:—

At Grand Rapids, Mich., $6,000 damage was done to the Grand Rapids Corn Planter works.

Fire destroyed the old Weed & Becker axe factory at State Dam, near Cohoes, N. Y., owned by Cohoes Co. Loss $10,000; no insurance.

Robbins & Myer's foundry at Florenceville, near Springfield, O., was damaged $2,500; insured.

Thomas Champney's machine shop at Leadville, Col., burned with several thousand dollars loss.

Fire in the machine shop of C. G. Hussey & Co.'s copper works at Pittsburg, caused a loss of $10,000.

The O'Brien foundry, at San Francisco, was damaged $5,000 by fire Oct. 14.

Fire at the Hood Machine Co.'s plant, at Birmingham, Ala., Oct. 17, caused a loss of $15,000; insured.

General Industrial Notes:—

The Newton Machine Tool Works, of Philadelphia, has just received the contract from John Brown, of Sheffield, Eng., a large manufacturer of armor plate of a special double radial drilling machine for drilling armor plate. The firm is also completing the drawings of a large cold saw cutting-off machine for the Armor Plate Works, at Creusot, France. Charles C. Newton, has just returned from abroad, having gone on the special invitation of these firms to secure an order for these machines.

At St. Louis in the case of the Pittsburg Crucible Steel Co., against the Diamond Steel Co., the United States Court of Appeals has handed down a decision in favor of the appellee, affirming the opinion of the lower court. The case was brought to restrain the appellee from imitating a trademark of the appellant, and from selling goods having that trademark or any simulation of it. The court decided that no damage had been sustained by the appellants.

W. S. Rockwell & Co., New York, have just completed the erection of four double end annealing furnaces 26 feet long by 14 feet wide and installed their largest size duplex system for burning fuel oil for the Detroit Copper & Brass Rolling Mills, Detroit, Mich.

The Porkhouse mill, operated by the Pittsburg Forge &

This Letter Should Interest Many People:

SAN ANTONIO STREET RAILWAY COMPANY,
SAN ANTONIO, TEXAS.
W. H. WEISS, ... President.

MR. JOHN G. HUNTER, Dallas, Texas. August 30, 1898.

Dear Sir:—We are pleased to be able to tell you that the 700 h. p. Cochrane Exhaust Heater sold us about six months ago, has been in continuous use since installed, and with very satisfactory results, both in freeing our feed-water from lime and magnesia, with which it is heavily impregnated, as well as the saving in fuel secured through its use. We have no difficulty in heating our water to 200° F., taking the exhaust from two pumps; when we use three or more pumps we carry the heat at 210° F. with the greatest ease. Moreover, we find that by its use our boiler capacity is materially increased. So far as our experience goes, the apparatus is mechanically perfect, and we cheerfully recommend it to all steam users.

Yours truly, (Signed) W. H. WEISS, President.

The Cochrane Heaters are made by THE HARRISON SAFETY BOILER WORKS, Philadelphia, Pa.

Iron Co., Allegheny, Pa., has been busy of late. In the puddling department 16 furnaces are in operation, and in the finishing department three furnaces are being run double time. The guide mill is in full operation.

There were 27 furnaces in blast and four idle in Allegheny County, Oct. 1. The idle stacks consist of the Edith, in Allegheny, one of the Eliza stacks of Laughlins & Co., and one Edgar Thomson furnace.

Since the sale of the Valentine Iron Co.'s plant, at Bellefonte, Pa., the purchasers have been at work organizing a new company to operate the furnace and ore mines and have about completed the organization. John M. Dale, of Bellefonte, and Baltimore capitalists are interested.

The Whiting Foundry & Equipment Co., Harvey, Ill., has sold two No. 9 cupolas to the Leechburg Foundry & Machine Co., and one No. 6 cupola to Graff & Co., Monongahela City.

L. Leonard Boyce, of Chicago, has been appointed receiver for the Continental Wire Co., of St. Louis. He represents the holders of a mortgage on the company's plant at Granite City, Ill., given as security for payment of $125,000 bonds, together with $20,000 interest, both overdue.

The steel rail mills of the Maryland Steel Co., at Sparrow's Point, Md., was started up Oct. 19, after being idle for some time. Furnace A, which had been banked several weeks, on account of lack of ore, has been blown in.

Among recent shipments by the Hilles & Jones Co., Wilmington, Del., was a set of plate bending rolls capable of bending three-quarter inch plate 12 ft. wide for the Oregon Short Line, Pocatello, Idaho.

The Brown & Sharpe Mfg. Co., Providence, R. I., recently installed a Rice & Sargent cross compound condensing engine of 350 indicated h. p. in the main machine shop. The new engine takes the place of a pair of non-condensing simple engines of the Corliss type. One of these engines was built in 1872. The change will effect a saving of 10 tons of coal a week. The gain in economy illustrates the great advance made in steam engineering during the past 20 years.

Furnace No. 1, of the Watts Steel & Iron Syndicate, Middlesborough, Ky., is banked because of insufficient supply of ore.

The rod mill at Anderson, Ind., of the American Steel & Wire Co., which has been in operation throughout the strike in the wire and nail department, has been closed down.

At Allegan, Mich., Irving A. Brown has purchased the foundry business of Thos. Stewart.

Equipment business announced by last week's *Railroad Gazette* included the following: Lake Shore, 45 heavy locomotives; Norfolk & Western, 10 locomotives; Buffalo, Rochester & Pittsburg, 10 locomotives; Atchison, 35 locomotives; Cape Fear & Yadkin Valley, 50 box cars and 50 flat cars; Burlington & Quincy, 200 more freight cars; Iowa Central, 250 box cars; Union Pacific, Denver & Gulf, 50 refrigerator cars and 200 coal cars. The orders recently placed by the Columbus, Hocking Valley & Toledo were as follows: 150 gondola, 100 flat, 50 box, and 50 side dump cars, Ensign Mfg. Co., for delivery Nov. 1; 100 gondolas, Barney & Smith Car Co., and 250 gondolas, Michigan-Peninsular Car Co., for delivery this month.

At Sioux City, Ia., F. T. Green has been appointed receiver for the Sioux City Brass Works. Assets are $8 000; liabilities, $6,000.

Stockholders in the Howard Iron Works, Buffalo, N. Y., have asked in court for an order removing Peter Burtiss and Henry Bull from their offices of president and secretary of the company. They allege that the last election held by the stockholders was irregular because the defendants refused to allow the voting of the 305 shares held by the Howard estate, which is a majority of the stock.

The bale tie interests of J. Wool Griswold, of Troy, N. Y., and the Pittsburg Bale Tie Co., of Braddock, Pa., have consolidated. The business will be handled from Braddock.

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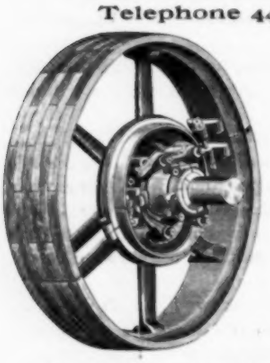

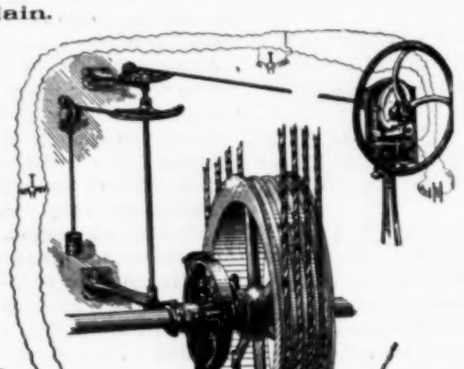

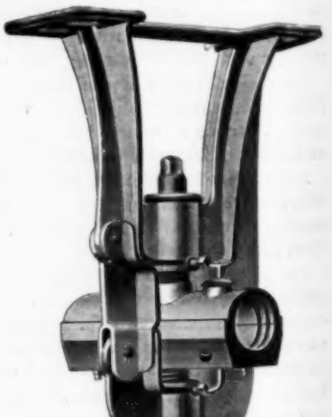

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GENERAL AGENTS FOR THE DODGE INDEPENDENCE WOOD SPLIT PULLEYS.

Eaton & Prince Co., Chicago, are named among the elevator concerns that are trying to form a consolidation. Direct purchases of plants are contemplated.

The Leechburg Foundry & Machine Co., of Pittsburg, has awarded the Wellman-Seaver Engineering Co., of Cleveland, the contract for the electric traveling cranes for the new ingot mold department to be erected at Homestead. The traveling equipment will consist of one 30-ton crane with a six ton auxiliary hoist, one 15-ton and two 10-ton, all special designed for high speed work.

At Buffalo, 130 molders went out on strike last week. They left the foundries of the Snow Steam Pump Works, Farrar & Treffts and the Fillmore Avenue Foundry & Iron Works, of Buffalo, and the Buffalo Steam Pump Works, of Tonawanda. The molders of Buffalo demanded a minimum of $2.25 a day, that all wages over that rate shall remain what they are, and that all differences between men and employers shall be settled by aribitration. In 14 foundries the demands were granted. Refusal in others led to the strike.

The Columbia Fire Clay Co., with offices at 412 Cuyahoga Bldg., Cleveland, and 34 Shannon Bldg., Pittsburg, is working deposits at Washingtonville, Columbiana Co., O., adjoining worked-out coal property belonging to the company. An eight-foot vein of high grade plastic clay was found, very

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free from sulphur, and well adapted to metallurgical work. Operations were started at Washingtonville in June and the company has introduced its product quite extensively, shipments having been made, among others, to the Cleveland Rolling Mill Co., the Union Rolling Mill Co., and the River Furnace, Cleveland; the Cherry Valley Iron Works, Leetonia; Mahoning Valley Iron Co., Brier Hill Iron & Coal Co., and Ohio Steel Co., Youngstown, O.; and the Lorain Steel Co. For ladle linings, furnace work and all service requiring high refractory qualities, this clay is particularly commended. The officers of the Columbia Fire Clay Co. are E. B. Case, president; F. R. Shunk, secretary and C. A. Case, treasurer. R. H. Smith is Pittsburg agent.

The two 25-ton steel furnaces of the Alabama Steel Co., at Fort Payne, Ala., have been sold at public outcry, to E. N. Cullom, of Birmingham, Ala. The price paid was $80,000, part of which was cash, the remainder in bonds of the company.

A new battery of boilers is being installed at the Laughlin Nail Co.'s plant at Martin's Ferry, O.

At Springfield, O., the shops of Amos Whiteley & Co., harvester manufacturers, who went into the hands of a receiver four years ago, were sold Oct. 19 to the Superior Drill Co., for $66,700. They cost nearly half a million.

CONSUL HALSTEAD writes from Birmingham, Eng.: "It is my belief that a sale could be developed here for American ornamental stamped steel ceilings and kindred stampings, now used so generally in the United States as a substitute for plaster for ceilings and walls. If some American manufacturer of these steel stampings will send me catalogues and approximate prices I will place them in the hands of an enterprising English architect, who has agreed to seek an opportunity for experimental use."

AN interesting feature of the work the Illinois Central is now doing on the 265-ft. draw span of its bridge at West Point, Ky., is that all the rivets are being driven by pneumatic hand hammers, while the compressed air is furnished by a 12-h. p. direct-connected gasoline engine and air compressor, located on the bridge about the middle of the span. A storage tank is placed near the compressor from which pipes are run along the bridge having hose connections at suitable intervals. The rivets which are being used are three-quarter inch and seven-eighths inch in diameter, and it is estimated that one hammer does the work of about three men riveting by hand.

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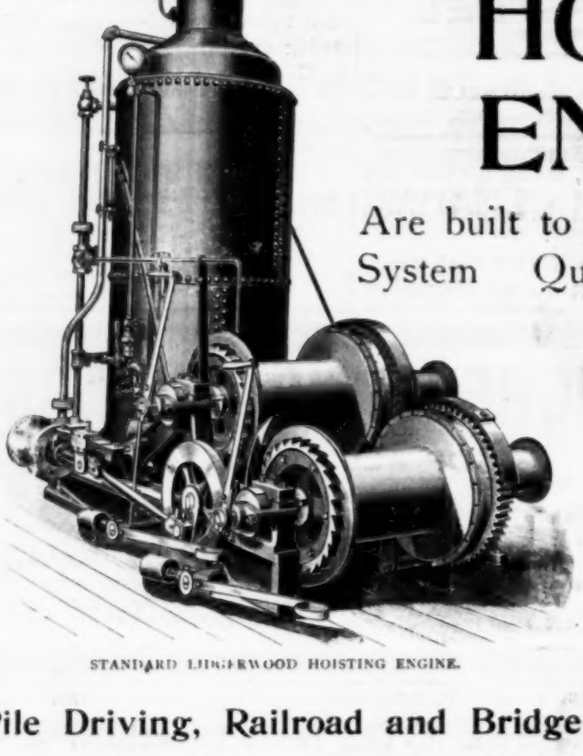

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